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THE VETERINARY JOURNAL

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GLADSTONE MAYALL, M.R.C.V.S.

MARCH, 1935.

Editorial

A NEW VETERINARY BILL FOR NORTHERN IRELAND

FOLLOWING up the successful attempt of our colleagues in the Irish Free State to protect the sick animal from the charlatan, the authorities of Northern Ireland have brought forward a Bill " to amend the law relating to the practice of veterinary surgery and medicine by persons other than registered veterinary surgeons."

It seeks to prohibit the practice of veterinary surgery or veterinary medicine except by qualified men, and if successful will do away with a lot of the cruelty which is caused (often, of course, unintentionally, and through meddlesome ignorance) by the amateur diagnosis and treatment of the illnesses of animals. It seems such an anomaly that English people, whose kindly sentiments towards animals are known throughout the world, should tolerate this state of affairs, as even the animal of the poor man has as much right to receive proper veterinary treatment when sick and helpless as the animal of the rich—and no veterinary surgeon will ever refuse to give his help without fee in deserving cases.

The penalty for a breach of this section is £100, or, in default, imprisonment for a term not exceeding three months. Nothing in the section shall render it unlawful for any farmer or other person who habitually keeps animals for profit, or the servant of such person, to perform any operation on, or administer medicine to, any animal, incidental to usual care and management of animals of that class, provided such person does not hold himself out as a registered veterinary surgeon. The Bill also proposes that it shall not be lawful for any body corporate to practise, or to represent or hold itself out as practising, or being prepared to practise, veterinary surgery or veterinary medicine. Contravention of this section renders the offending body liable on summary conviction to a fine not exceeding £100 and not less than £50, and the manager and every director of such body shall also be liable on summary conviction to a fine of a similar amount; or, alternatively,

in default of payment of such fine, to imprisonment for a term not exceeding three months. Every offence under the Act may be prosecuted at the suit of the Council of the Royal College of Veterinary Surgeons or of any person authorised by the Council.

Animal lovers and members of the profession in Great Britain will anxiously watch its course, and, if successful, will most certainly urge Parliament to render a similar service to the sick animals of this country too.

THE PART PLAYED BY THE VETERINARY OFFICIAL IN PUBLIC HEALTH.

MAJOR RABAGLIATI, lecturing before the University of London on "The Importance of the Veterinary Profession in Public Health Administration," drew attention to the growth of legislation in Great Britain, especially in respect of diseases intercommunicable between man and animals. He traced the history of animal hygiene in this country from the earliest times, and alluded to the steps which preceded the passing through Parliament of the Contagious Diseases of Animals Act in 1869, and the pioneer work done in this respect by our predecessors in the Council Chambers of the Royal College of Veterinary Surgeons and the Ministry of Agriculture. Previous to the passing of control regulations, Great Britain suffered great losses; but now, as the result of the measures taken on the advice of veterinary officers, many of the contagious diseases of animals have been eradicated from our midst.

In this the department of the Ministry of Health shares the responsibility with that of the Ministry of Agriculture, for there are numerous diseases which, if stamped out of the animal world, automatically disappear from man, as their source of origin in man comes *via* an animal. No better illustrations can be given of this than in the cases of glanders and rabies; and, as regards an illustration of a disease whose eradication has benefited the cattle themselves, one cannot have a better instance than cattle plague, which raged in England as a fatal scourge in 1865; or contagious pleuro-pneumonia, which although not so rapidly fatal, caused the agriculturists so much animal loss a few years later.

Although primarily to eradicate the tuberculous cow, there is no doubt that the periodical presence of the official veterinary officer on the premises will cause the dairyman or the farmer to take more interest in his stock, and use more hygienic care in the cowsheds and other surroundings. The prospective value to the community can be foreseen by comparison with what has already been done in the United States of America, where serious concerted efforts against tuberculosis commenced about 1917. According to the Bureau of Animal Industry the numbers of cattle tested with tuberculin has steadily increased from about 20,000 in 1917, to about 13,000,000 in 1933; whilst the milk consumption had increased from 68.1 in 1927, to 88.7 in 1931.

In England there is no question but that the "Drink More Milk" slogan will receive an enormous impetus in British households when the purchaser of milk can have assurance that the bugbear of the dread of bovine tuberculosis infection no longer exists; and it is to a properly arranged veterinary inspection of our dairy herds that the public looks in order to attain that end.

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General Articles

THE IMPORTANCE OF THE VETERINARY PROFESSION IN PUBLIC HEALTH ADMINISTRATION.*

By MAJOR RABAGLIATI, B.Sc., F.R.C.V.S.

Chief Veterinary Officer for the West Riding of Yorkshire.

It is only in quite recent years that it has been realised that disease is one, whether it occurs in man or in the lower animals, and also that many human ailments can be contracted either directly or indirectly from the animal population. This knowledge has done much to bring the medical and veterinary professions together, and year by year as our knowledge in this direction becomes greater we find that the bonds which unite our sister professions become stronger and stronger. The term " veterinary public health," however, does not only apply to the study of those diseases which may infect man, but to the control of contagious disease of animals in general. Veterinary public health work may thus be divided into two classes: (1) The control of animal disease from a purely economic standpoint; and (2) the control of animal disease from the point of view of human health. Naturally, it is in dealing with the latter that we meet the medical profession on common ground.

Many, if not all, members of the veterinary profession engaged in public health work have from time to time criticised the laws and regulations which deal with animal diseases in this country, partly because they do not go far enough, but more so owing to their complexity and overlapping and from the fact that they well illustrate the old adage that " too many cooks spoil the broth." We are too apt, I think, to forget that most of our laws dealing with the public health aspect are of comparatively recent origin, and when we consider the slow methods which we adopt in this country of dealing with any legislation, we have, I venture to think, good reason to congratulate ourselves on the progress we have already made when compared to the state of affairs only a few years ago.

The tendency to-day seems to be towards new and ever more regulations and restrictions, and too often we never pause to inquire whether we utilise those regulations we already have to their fullest extent before demanding more. Retrospect is always illuminating and instructive, and for this reason I came to the conclusion that in my first lecture I would give you a short historical account of how we came to legislate for the control of disease in the lower animals. Nothing can show better than this how the veterinary profession came to take its part in our public health administration.

* First of a series of Lectures, delivered at the Royal Veterinary College, London, February 28th, under the auspices of the University of London.

Of all sections of veterinary public health the one which is most before the public to-day is that dealing with our milk supply. We both see and hear it discussed by all and sundry, and approached from all angles, and it is now rare to take up a daily paper without seeing some reference to milk, its price, its purity, its adulterations, its many dangers, or some other question concerning its production. I have thus chosen the subject of " Milk and the Veterinary Profession " for my second lecture.

The Growth of Legislation in Great Britain dealing with the Control of Animal Disease, especially in respect of those Diseases Intercommunicable between Animals and Man.

Before speaking of the growth of this legislation, it may be as well to enumerate those diseases which are scheduled in Great Britain under the Diseases of Animals Acts and Orders at the present time, so that those of my audience who are not familiar with them may the better appreciate the evolution of our laws which deal with them. Fortunately, many of the conditions I am about to name have ceased to exist in this country; but despite of this we must always be alert lest one or other of them makes its appearance once more amongst our herds, flocks or studs. These diseases are, first, those which are now stamped out: cattle plague, contagious pleuro-pneumonia of the ox, sheep pox, epizootic lymphangitis of the horse, ass or mule, glanders, and farcy and rabies. Secondly, those which are still present, or which occur from time to time: foot-and-mouth disease, swine fever, anthrax, parasitic mange in equines, sheep scab or scabies of the sheep, and for some purposes tuberculosis of cattle and contagious abortion of the cow.

The history of the legislation by which we to-day control animal disease is the story of indifference, ignorance and gross prejudice, whereby vested interests have too frequently been allowed to interfere with progress. Indeed, it can hardly be said that these remarks do not in some respects apply even to-day, although the fight the reformer has in 1935 is not met by the same stubborn opposition as was the case a hundred or even fifty years ago. It is difficult to believe that with all the complicated regulations now in force dealing with animals, too complicated by far, and yet not far-reaching enough in many respects, only seventy years ago there was no legislation of any sort worthy of the name. Nevertheless, before we judge our forefathers too harshly, we must remember that the doctrine of the contagious nature of disease was only then slowly becoming known, and that many of the members of the medical and veterinary professions refused to accept it. No less an authority than Professor Dick, of Edinburgh, great clinician that he was, and to whom our profession owes so much, did not consider that foot-and-mouth disease, sheep pox, pleuro-pneumonia or cattle plague were contagious when he died in 1866. Nor did he realise that rabies could be transmitted by the bite of a rabid animal. It was only in 1875 that Simonds, for many years Principal of the London Veterinary College, and a man whose advice was so much sought after in dealing with epizootic disease, relinquished his former

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view that disease always originated spontaneously, and accepted pleuro-pneumonia as being contagious. This fact had been asserted by other veterinarians many years previously. Not only were these doctrines of spontaneous origin accepted by the veterinary profession, but many medical men also strongly believed in them. This being so, it is not to be wondered at that those against legislation which might interfere with their trades and businesses made the most of the divided opinions of the experts. The conflict of views seems the more strange when so long ago as 1714, Bates (a surgeon) suggested that cattle plague was infective, and £2 per head was paid for every such carcase buried.

In 1748, an anonymous writer under the pseudonym of " Iator " recommended that compensation should be paid for all cattle-plague infected animals slaughtered, and even went so far as to advocate the formation of a Board of Animal Health. Later again, in 1793, Samuel Bardsey, M.D., considered that rabies could not arise spontaneously, and in 1807 stated that it was only propagated by inoculation. He advocated " establishing an universal quarantine for dogs within the kingdom, and a total prohibition of these animals during the existence of this quarantine." He considered that a period of two months quarantine was sufficient, and begged to have this carried out. Little or no notice was taken of his views, and it took nearly a hundred years to establish the truth of his work.

To illustrate the hostility to such views as these, I may mention that William Youatt, the famous veterinary surgeon, also came to the conclusion, following the opinion of Blaine, that rabies was due to the bite of a rabid animal. Moreover, he asserted that the causes usually ascribed to it were untenable, and for these reasons was bitterly and unfairly attacked by an eminent and able member of the medical profession who, incidentally, was an old and intimate friend of Youatt's father.

Again, in 1812, James White, a veterinary surgeon who once served in the Army, looked upon glanders as contagious; and a few years later another member of our profession, Thomas Peall, stated that the control of glanders must begin with legislation, and that the sale of glandered horses should be made a penal offence.

The first legislation enacted in this country to combat contagious diseases was against sheep scab, and dates as far back as 1798, but apparently these regulations were not much utilised. The prevalence of this disease amongst our flocks to-day does not reflect great credit on our local authorities, flock masters, or even on our veterinary services. There does not seem to have been any general attempt to control disease from this date until 1848, although from 1833–1842 there was an Act enforced which prohibited the importation into England and Ireland of cattle, sheep and swine.

In 1842, cattle were again imported from abroad, but were subject to a tax or duty until 1846, when our free-trade regulations came into being, and cattle were imported free. This change was responsible for the introduction of sheep pox

into the country in 1847. Sheep pox is a form of variola or small pox of the sheep. It is an acute febrile exanthematous disease affecting sheep only, and frequently runs an acute and rapidly fatal course, especially in lambs. In older sheep an eruption occurs on the mucous membranes of the eyes, nose and mouth, and hairless parts of the skin. It causes great loss amongst affected flocks, but fortunately no case has been introduced into this country since 1865. Simonds was the first to diagnose and describe this disease in England, and the best scientific work he ever carried out was in connection with sheep pox. It is to Simonds that we owe the fact that the Government brought in an Act which enabled infected animals to be destroyed at the ports, but by this time the disease had affected countless thousands of sheep all over the country.

Another Act was passed regulating movement, as up to this date no power had existed to prevent the importation and subsequent movement of diseased animals. This led to an Act, in 1853, in which glanders was first included in legislation. Its inclusion may be looked upon as the first effort made in controlling an animal disease which affects mankind ; but let it be remembered that this inter-infectivity was not known then, nor was the legislation brought in as a public health measure.

The first real step forward in regulating the control of disease was the result of the outbreak of cattle plague in 1865. Serious as this disease has been, we veterinarians may look upon it as being a blessing in disguise, for it is the first plague which gave the necessary opportunity for showing the Government and public the necessity of taking veterinary advice. Cattle plague is the same condition as the rinderpest of Africa. It has for many centuries been looked upon as the most serious pest from which cattle suffer. Cattle are the animals chiefly and most seriously affected. For the benefit of my lay audience, I may say that it has nothing to do with foot-and-mouth disease, with which it has frequently been confounded in the press. It causes an acute inflammation of the mucous membranes, especially those of the digestive tract, and gives rise to severe dysentery. It is a very fatal disease, and has decimated herds in many parts of the world. After many outbreaks in this country, it has never been seen in Great Britain since 1877.

The disease occurred on frequent occasions in the eighteenth century, and the 1745 outbreak took twelve years to eradicate, after which there was no other infection introduced for nearly a hundred years.

The 1865 outbreak was due to infected cattle from Russia, and had the advice of John Gamgee been taken it need never have been introduced at all. I would like to stress the work of Gamgee as of primary importance, for some years before this he preached the gospel of the danger of introducing the disease, but those in power, and most of the public, including the medical profession and many veterinarians, were deaf to his advice.

We probably owe the present-day policy of dealing with disease more to John Gamgee than to any other man. While a student in London few dared to

doubt the spontaneous origin of disease, but later on he spent much of his life and energy in combating these ideas. He travelled on the Continent to study the methods adopted by other countries in dealing with contagious disease, because primarily he knew that we in this country had no machinery for dealing with them. While speaking of Gamgee, I would quote from the work of the late Major-General Sir Frederick Smith, to whom I am indebted for much information given in this lecture. He says: *

"One of the objects for which Gamgee struggled throughout his professional life was a better and a higher veterinary training in the schools. He realised that the position of the profession in the future depended upon its members having the same acquaintance with science as the general practitioner in medicine, who earned the respect and gratitude of those amongst whom he lived. Gamgee believed that precisely the same position would be accorded to our profession if the men were better trained. Consequently he urged an extension of the curriculum as the first necessity. The profession had yet to be formed, in his opinion, by the addition to its numbers of a large body of men possessing a true love for learning."

It should be recalled that Gamgee was the first man to point out the danger run by the public from the consumption of diseased flesh, and to him the credit for our meat inspection laws is originally due. In this connection I would again quote from Smith, who, in describing Gamgee's agitation in favour of some control over our meat supplies, states: "At last, about 1858, a Parliamentary Committee was appointed to report, and its conclusion is worth placing on record. It was to the effect that the Government always had it in its power to prevent extreme evil consequences from the consumption of diseased meat, and any further steps would be an undue interference with legitimate trade. No wonder that when Gamgee was asked at the first International Veterinary Congress of 1863 what Great Britain did with her diseased meat, he briefly answered, "eats it."

Why have we not in England recognised the veterinary efforts, and employed our profession for this purpose?

The history of our meat inspection regulations makes very painful reading, and our methods of dealing with our meat supplies, especially in England and Wales, are much behind those by which we control disease. Scotland is now far ahead in this respect, and its recognition of the veterinarian as the most suitable official to inspect our meat should be a lesson to us south of the Border.

I have digressed at some length in speaking of Gamgee, but his influence in the history of the control of disease justifies a very important place.

The cattle plague outbreak was neglected from its onset, and veterinary advice was disregarded. The campaign against this disease was handed over to the Medical Department of the Privy Council, who appointed a doctor as secretary, and the Government selected a senior officer of the Engineers as director!! Never-

*Smith, Major-General Sir Frederick: "The Early History of Veterinary Literature." London: Baillière, Tindall & Cox, Vol. IV, 1933, p. 151.

theless, the outbreak resulted in the cattle department being formed, which had two noted veterinary surgeons on it, namely, J. B. Simonds and Sir George Brown. A Royal Commission was appointed to advise on the disease, and this body of medical men and laymen had only one veterinary surgeon on its membership. Its terms of reference were: "Fully to investigate the origin and nature of the said disorder, and to ascertain as far as possible the mode of treatment best adapted for the cure of the affected animals, and the regulations which may with the greatest advantage be made, with a view to prevent the spreading of the said disorder, and to avert any future outbreak of it."

The veterinary member of the Commission recommended the prohibition of import and the destruction of infected and in-contact cattle. This advice was not acted upon, although power to do so already existed in the 1848 Act to which I have previously referred, but it was not put into force.

While the Commission did its work thoroughly from a scientific standpoint, it took a long time to convince the public that the stamping out system was the only practical means of dealing with the plague, a method which was then, according to Brown, denounced as one " worthy only of the untutored savage."

In the light of more modern events, when considering a recently constituted commission of inquiry, one is forced to the conclusion that the public still does not appreciate who is its best adviser on the question of animal health and disease.

After complete failure in dealing with this outbreak of cattle plague, veterinary assistance was sought, and Gamgee's advice was at last taken. This soon reduced the extent of the disease, and it was ultimately exterminated. When it had been stamped out the Veterinary Department of the Privy Council was established, with a veterinarian in the person of Simonds as its head. This now led on to the passing of the Diseases of Animals Act of 1869, which dealt with cattle plague, pleuro-pneumonia, foot-and-mouth disease and sheep pox.

In the annual report of the Director of the Veterinary Department of the Board of Agriculture for the year 1893, Sir George Brown, when discussing the conditions which led up to the Diseases of Animals Act of 1869 and 1878 being passed, wrote the following: " Meanwhile cattle plague," referring to the outbreak in 1865–67, " had by this time been almost exterminated by an application of the system of slaughter which had at last been enforced after it had been recognised that all the milder methods had failed to check the progress of the malady." It may be added, however, that the stamping out of the disease after more than two years of prevalence was effected in the face of strong opposition in many quarters.

Up to this period the action taken for the suppression of animal diseases was concentrated upon cattle plague. It is, however, a matter of history that the country was not, and had not for a long time been, free from other animal plagues, most of them of foreign origin. Foot-and-mouth disease had existed in this kingdom since 1839, pleuro-pneumonia since 1840, anthrax, sheep scab, swine fever and rabies, from an unknown period. Sheep pox had been introduced

on three occasions, in 1847, 1861 and 1865, but had not been allowed to effect a permanent location in the country. The other maladies seem to have been accepted by the stockowner as among the disabilities incidental to the pursuit of agriculture, and the idea of getting rid of them by legislative action had not been favourably received on the few occasions when it took a practical shape. Even as late as 1864 a Bill which was introduced by Mr. Bruce and Sir George Grey for the prevention of contagious diseases among cattle met with so much opposition from stockowners that it was finally withdrawn. A committee which sat in 1873, some years after foot-and-mouth disease had been constituted a disease by Act of Parliament, recommended " that the Privy Council should cease to issue Orders for the check of the disease." As no good effect had been produced by the regulations, this recommendation was adopted, but the Royal Agricultural Society of England intervened with a protest, and the Orders were re-enacted.

The Act of 1869 was amended by another Act in 1878, and by this legislation the local authorities were first empowered to deal with disease. This Act is the basis on which our present Acts and Orders are founded, and was of paramount importance to the cattle industry and to the public as a whole. The chief alterations over previous procedure were: (1) The treatment of outbreaks of cattle plague; (2) the treatment of outbreaks of pleuro-pneumonia and foot-and-mouth disease; (3) the importation of foreign animals, and the provision for uniformity of action as regards Great Britain and Ireland.

Cattle plague was to be dealt with by officers of the Privy Council instead of the local authorities, and compensation for slaughtered animals paid out of Exchequer funds. Pleuro-pneumonia and foot-and-mouth disease were still to be dealt with by the local authorities, but the Privy Council was given increased power to make provision and regulations for infected areas. Slaughter by the local authorities in the case of pleuro-pneumonia, with the payment of compensation, was made compulsory, and power was also given to slaughter cattle that had been exposed to infection. Foreign animals were only to be landed at certain stipulated wharfs and there slaughtered.

The appointment of veterinary inspectors for certain duties by the local authorities now became compulsory, and the qualifications required for these were laid down in the Act. The Act of 1878 likewise gave power to the Privy Council to make Orders relative to dairies, cowsheds and milkshops, which included power to order " the inspection of cattle in dairies." This power, which, however, was not made use of until 1885, may be looked upon as the birth of our present legislation connected with the milk supply, so far as England Wales are concerned, and from the public health standpoint was of extreme importance, slow as we have been in developing it. In Scotland, legislation dealing with this was enacted as early as 1866. This I shall refer to again.

Strangely enough, a Glasgow physician called Harley in 1810 started a dairy of twenty-four cows to supply milk for his patients. The milk was produced under novel conditions, and everything run by steam power. This was the first farm

which went in for clean milk production, and the venture prospered so that four years later, in 1814, no less than three hundred cows were kept. Visitors to the farm were encouraged, and a charge made for them to be shown round to view the process. The production of this high-grade milk seems to have been dropped, and nearly a hundred years elapsed before a clean milk campaign was again taken up. As showing the state of public opinion at the time this Act was passed, I may quote from the report of the chief veterinary officer of the Privy Council for the year 1878 : " The clause which gave the Privy Council power to extend the term ' animal ' so as to include an animal not referred to in the Bill, was objected to on the plea that the extension of the clause was to enable the Privy Council to deal with dogs, whereas the Bill was in reality a cattle Bill. The clause was accordingly withdrawn, and the power to deal with rabies was therefore lost. Another clause giving the Privy Council power to extend the definition of ' disease ' was allowed to remain."

Swine fever was added at the end of the year to the diseases named under the Act, and anthrax and rabies,despite the opposition to the latter already mentioned, were included by Orders of the Privy Council in 1886.

Glanders, sheep pox and sheep scab were also included on the passing of the Bill. In 1883 the title of Veterinary Department was altered to Agriculture Department, and the work of collating the agricultural returns was transferred from the Board of Trade to the said Agricultural Department, and in the same year an Order in Council was passed appointing a Committee of Council for Agriculture, to whom all agricultural matters were to be referred. In 1889 the Board of Agriculture was established by Act of Parliament, and the Veterinary Department, which had previously been under the Privy Council, was included in it along with other departments of State. In the same year the powers held by local authorities for the slaughter of cattle affected with pleuro-pneumonia were transferred to the Board of Agriculture.

In chronological order, I now come to some important legislation regarding the milk supply, but before discussing it I would mention that Scotland, always in the van where public health is concerned, had a law passed in 1866 known as the " Cattle Sheds in Burghs (Scotland) Act, 1866."

In the case of Royal burghs, burghs, and other populous places, it was necessary for all cattle-sheds, cow-houses and byres to be registered, and these were subject to inspection, and power was given to insist on improvements against the owners, being liable to fines if the instructions were not acted upon. The licences were granted for a year at a time. Compare this with our present system in England, where the licences for dairies are for all intents and purposes continuous. This Act, however, gave no power to examine the cattle in the dairies.

In 1885 " The Dairies, Cowsheds and Milkshops Order of 1885 " was brought in under the powers mentioned in the Diseases of Animals Act. It is to be noted that this Order was introduced by the Board of Agriculture and applied to England, Scotland and Wales. As well as regulating the conditions of the premises and

giving power to local authorities to make bye-laws for the dairies in their own districts, Article 15 reads as follows: "Existence of disease among cattle. If at any time disease exists among the cattle in a dairy or cowshed or other building or place, the milk of a diseased cow therein (*a*) shall not be mixed with other milk; (*b*) shall not be sold for human food; and (*c*) shall not be sold or used for food of swine or other animals unless and until it has been boiled." The word "disease" includes all diseases mentioned in the 1878 Act. The Order also gave permission to local authorities to make, *inter alia*, regulations "for the inspection of cattle in dairies," but this was not much made use of in England. Moreover, it was not then essential to employ veterinary surgeons.

In 1889 an amending Order added the following to the meaning of the word "disease": "in the case of a cow, such disease of the udder as shall be certified by a veterinary surgeon to be tubercular." This is the first inclusion of bovine tuberculosis in a public health measure and, incidentally, also the first mention of the veterinary surgeon. It was in the year 1888 that investigations were carried out by Woodhead and Crookshank to see whether cows suffering from tubercular mastitis might infect children. This inquiry was no doubt responsible for the inclusion of tuberculosis in the Order referred to. In 1889 the scheduling of tuberculosis under the Diseases of Animals Acts and the payment of compensation for carcases condemned for this cause were discussed, but it was pointed out that the powers of the said Acts did not extend to public health. Despite of this and other attempts to bring in tuberculosis, it was not included until 1913.

In 1899, in connection with the Amending Order of that year, the Local Government Board drew the attention of local authorities in Scotland to the following points: "The obligation to inspect milch cows rests upon the local authority. For the purposes of Sections 43 and 60 of the Public Health (Scotland) Act, 1897, relative to the detection of unsound food and the discovery of the origin of infectious diseases attributable to milk, it is necessary that local authorities shall have previously 'approved' veterinary surgeons available, who may also be employed in the execution of the Order."

In 1894 the Diseases of Animals Act of 1878 was remodelled and brought up to date, and the original Act was completely repealed, with the exception of one section. This 1894 Act, which is still in force, is the main Act of to-day, and all present legislation has been made in accordance with its terms, although subsidiary Acts have been placed on the Statute Book from time to time since it was passed, the latest being in 1927.

In 1919 the Board of Agriculture was dissolved by Act of Parliament, and the Ministry of Agriculture formed in its place under a Minister of State. This Ministry is responsible for the carrying out of the Acts either through its own staffs or in many cases by local authorities. The Minister may make such Orders under the Act as he deems necessary, and may draft Orders for scheduling new diseases, or extend the definition of the word "animal" as he may require. Certain diseases are dealt with by the Ministry, and some by local authorities,

while again the duties connected with others fall partly on the Ministry and partly on local authorities. Before giving further details in regard to these Acts, I will discuss certain public health measures which have come into being since the passing of the 1894 Act.

In 1903 the Burgh Police (Scotland) Act was passed, and certain sections applied to the use of milk from diseased cows. These sections were optional instead of compulsory, and applied only to burghs who had adopted them. They imposed penalties upon anyone within the burgh selling milk from cows with tuberculosis of the udder, and made it compulsory on the owner to report diseased cattle, and gave power for a veterinary surgeon to inspect cattle. Authority to stop the use of the milk from a cow with tuberculosis of the udder was given, and also owners were told to report all such cases. Power to prohibit the use of the milk from any special farm was granted where tuberculosis was suspected. These conditions to a great extent were incorporated in the more recent milk legislation both in England and Scotland.

With the increase of our knowledge concerning disease and the means of its spread, large city authorities became alarmed at the slackness and lethargy shown by rural districts in carrying out their duties under the milk legislation, and certain of them applied to Parliament for certain extra powers to deal with the situation. Glasgow was the first city to obtain such powers, which it did in 1890, and this was followed by Manchester in 1899. Other cities also followed their lead, and some of those to obtain similar powers were Edinburgh, Birmingham, Liverpool, Leeds and Sheffield. We are greatly indebted to such pioneers in this veterinary public health work as Malcolm of Birmingham, Lloyd of Sheffield, Brittlebank of Manchester, Trotter of Glasgow, Gofton of Edinburgh, and others. Their examples and utterances have been greatly responsible for the increased powers given to urban authorities to deal with their milk and meat supplies.

Under the special regulations any dairyman in the city was legally bound to report a cow suspected of suffering from tuberculosis of the udder, and if the suspected animal were found to be so affected on examination by a veterinary surgeon, it had to be removed from the city premises. Power was also given to examine samples of any milk sold or intended for sale within the city, and if found to contain tubercle bacilli, the veterinary officer of the city had the right to examine the cows in the herd concerned. If the dairy from which such a sample was taken happened to be without the boundary of the city authority an order from a Justice of the Peace with jurisdiction over the area where the farm was situated was first required, and then a similar authority was granted which allowed the city official to take samples or examine the cows in the county area. While a dairyman within the city limits was prohibited from keeping a diseased cow he could dispose of it to a neighbour outside, and the same cow's milk might be sold within the city once again. If its contaminated milk were once more detected in the city, the cow might again be moved on from its new owner to yet another, and so on, for there was no power to insist on the animal being killed. This

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system was so ridiculous that after a great deal of agitation and plain speaking by those concerned with the milk supply of large boroughs, the Tuberculosis Order of 1913 was at last issued. This Order gave power to local authorities to slaughter all cows suffering from tuberculosis of the udder or giving tuberculous milk, or any bovine animal affected with tuberculous emaciation. The Order, which it was hoped would do much good, was revoked after only a few months' trial owing to the War.

The present Tuberculosis Order of 1925 was not issued until September of that year. In the Order, any bovine animal which is suffering from a chronic cough and showing definite clinical symptoms of tuberculosis is included, as well as those affected by the forms of disease previously specified. This Order has been much criticised, but it is as well to reiterate once again that it cannot, nor was it ever intended to, eradicate the disease. It was passed merely as a measure to help to secure a purer milk supply. Nevertheless, if wisely interpreted and administered, it may do a good deal to reduce the disease. It is in reality complementary to the milk and dairies legislation.

Since the commencement of this century public opinion has really wakened up regarding milk, and several inquiries were instituted which resulted in further new legislation. The work of the Royal Commission on Tuberculosis, which published its findings in 1910, exerted considerable influence on this legislation. The two most important Acts dealing with the milk supply and, incidentally, with disease in dairy cows, are the Milk and Dairies (Scotland) Act of 1914, and the Milk and Dairies (Consolidation) Act of 1915. The former applies to Scotland only, and the latter to England and Wales. Both these Acts, which were postponed owing to the War, became operative on September 1st, 1925. In the meantime, however, before these were effective, the Milk and Dairies (Amendment) Act was passed in 1922. The Act is still in force and applies to England, Scotland and Wales. This Act is important in that it gave power to the Minister (of Health) in England, and to the Department of Health in Scotland, to issue the Milk (Special Designations) Order of 1923. There is one Order for England and another for Scotland, and they deal with the formation and issue of licences for tuberculin-tested herds, " Certified " and " Grade A (T.T.)," Grade A, and also for pasteurised milk. The Orders were a great step forwards, and it is unfortunate that the increase of these herds has been so slow, owing partly to the public failing to appreciate the qualities of milk produced under such conditions, but possibly more on account of the increased cost of the milk. The 1922 Act also includes a section prohibiting the sale of milk from a cow suffering from tuberculosis of the udder.

The Scottish Milk Act makes the routine examination of dairy cows by veterinary surgeons compulsory on local authorities, although it only lays down the minimum number of visits as one per year. Many Scottish authorities, however, carry out more inspections than the minimum. There is also included power for the veterinary officer to test with tuberculin any cow he considers necessary,

provided the owner gives his consent in writing. In the English Act the Minister of Health had power to make a Milk and Dairies Order, which he did in 1926. This Order gave permission to local authorities of counties and county boroughs to carry out the routine examination of the cows in their respective areas if they so desired. Unfortunately, the examinations are permissive, and not compulsory, as in Scotland. This has been made use of by several county borough authorities, but until quite recently county councils did not take advantage of it, with a few exceptions here and there. The County Council of the West Riding of Yorkshire was the first county authority in England to institute a regular and general routine veterinary examination of all cows on registered milk, butter or cheese-producing farms. This was commenced in 1927, after the necessary veterinary staff had been appointed.

During the last year or two, and especially since the Milk Marketing Board commenced its operations, many other county authorities are taking more interest in the matter, and several have already appointed veterinary staffs, and more are now considering doing so.

These two Acts revoked most of the previous legislation dealing with milk and its production, and also all bye-laws made by sanitary authorities in pursuance thereof. The whole idea of this was to unify as much as possible the methods of milk production up and down the country. Although this has improved matters, human nature being what it is, local authorities interpret the Orders in varied degree. Some have proved very zealous to carry out their duties, while others are more than lax in doing so. There never was a time when public opinion was so ripe for considering changes in our milk enactments. What, therefore, do we see to-day ? Only last month, as the result of the Commission of Inquiry of the Cattle Diseases Committee of the Economic Advisory Council, the Ministry of Agriculture have issued regulations for freeing herds of tuberculosis under what is termed " the attested scheme." The rules laid down are not those actually suggested by the Commission, but there is but little doubt that the inquiry stimulated them. In effect, the Ministry promise to test herds free of charge if the owners submit certificates that the cattle in the herd have passed two complete and consecutive tuberculin tests without the occurrence of a single reactor. In this case, the Ministry's staff is to retest the whole herd, and if again no reactor be found a certificate of attestation will be granted. The rules are very severe, much more so than those laid down for the graded herds. It is unfortunate that the bonus offered for the milk is so small that it looks as though it would not pay the farmers to apply for inclusion in the scheme.

Having traced the stages by which we have attained the present state of our legislation, I will briefly mention what we do to-day when any of the scheduled diseases makes its appearance. The re-appearance of such diseases as cattle plague, contagious pleuro-pneumonia of the ox, or sheep pox would necessitate measures very similar to those now familiar to us for dealing with foot-and-mouth disease being adopted. Power exists to slaughter all animals so affected or in

actual contact. In the case of epizootic lymphangitis of the horse, the affected animals must be isolated till cured. It is, however, very unlikely that any of the above-named conditions will occur again.

Glanders.—While the disease has not been seen in Great Britain since 1928, it is quite possible that further cases may crop up again. These would be most likely to arise from imported horses, although importation is not allowed without the certificate of a veterinary surgeon of the country of origin stating that the animal has been tested with mallein and successfully passed such a test. Clinically affected animals must be destroyed and their carcases either incinerated or deeply buried in lime. All in-contact horses must be tested with mallien and any reactors destroyed. The use of mallein, which is a substance somewhat similar to tuberculin, has been successful in eradicating the disease from our studs when combined with better management and veterinary supervision. The Mines Department lays down very stringent regulations prohibiting any horse being taken underground unless it has passed a prescribed mallein test carried out by a veterinary surgeon. Should a suspected case be reported, information must immediately be given to the local M.O.H. of the district.

Rabies.—Fortunately, as is the case with glanders, this disease does not now exist in Great Britain. It was stamped out in 1902, but occurred again in 1917, when it leaked through owing to war conditions. This outbreak was not finally got under control until 1922, after which there has been no case in the country, other than in an animal in quarantine, up to the present date. It is prohibited for any one to bring a cat or dog into this country without licence, and this involves the imported animal being placed in strict quarantine for a period of six months. The fact that several cases of rabies have occurred during this period speaks for the wisdom of this regulation, tedious as it is to dog owners. The chief means by which rabies has been stamped out in the past is by muzzling all dogs. At one time it was tried locally, each local authority being empowered to issue muzzling regulations as it thought fit, but until the Government took over this power rabies was never stamped out. All animals suffering from rabies or having been bitten by a suspected or rabid animal must be destroyed. In the case of a suspected case being notified, the local M.O.H. must be informed.

Foot-and-Mouth Disease.—Outbreaks of this are continually occurring from time to time, and now and again the disease even assumes serious proportions in the country. In the case of initial outbreaks, that is in outbreaks after a period when the country has been free from the scourge, pigs are most frequently the animals to be affected, but the disease soon makes its appearance in cattle too. This in too many cases points to infection due to the feeding of offal from foreign carcases, despite stringent regulations being always in force to prevent meat products being fed to pigs without being boiled for at least one hour.

Thanks to the efficiency of the Ministry of Agriculture's staff, it is unlikely that the disease will again become general in this country. In the event of an outbreak all affected as well as direct in-contact animals must be destroyed, and

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a standstill area for a radius of fifteen miles is imposed around the affected premises. After slaughter has been carried out, the most rigid disinfection possible is carried out on the premises involved, and a prolonged period must elapse before the farm is allowed to be re-stocked. In case of the remote possibility of human beings becoming infected, the local M.O.H. must be notified of any outbreak, or even suspected outbreak.

Anthrax.—Sporadic cases of this disease still occur from time to time, and by far the most common animal to be affected is the ox. The most common symptom which causes one to suspect the disease is sudden death, and all unexplained deaths amongst cattle should be notified as suspected anthrax. It is prohibited to open the carcase of such an animal, but a rapid diagnosis can usually be arrived at by making blood films from some superficial vein in the carcase and staining it suitably and examining it under a high-powered microscope. If diagnosis is confirmed the carcase must be incinerated or buried deeply in lime, the former method being the more usual, and the one to be recommended. As considerable danger is run by butchers and others handling or dressing a diseased carcase, the local M.O.H. is again to be informed of any outbreak of this disease. The regulations now made by the Ministry of Health dealing with imported hides, fleeces, wool, and so on, are very stringent, and the number of people who contract anthrax, and especially the pulmonary form, is small compared to what used to be the case. The disease, moreover, shows a continual decline in animals year by year.

Tuberculosis and contagious abortion in cattle will be discussed more fully in my next lecture on Milk. The chief danger to man from these conditions comes from milk, although unsound meat may also be the source of tuberculosis infection. The remaining contagious diseases, which are swine fever, sheep scab and mange of the horse, are dealt with by a system of isolation, treatment being allowed. There is no question of slaughtering animals affected with these conditions.

I have endeavoured to show the lines on which legislation dealing with animal diseases has evolved. Alteration of method in dealing with disease must closely follow increased knowledge, but before new laws can be made it is essential to carry public opinion along with it. It is by no means an easy task to convince the public of the necessity of imposing new measures and new restrictions on what is usually called "the liberty of the subject." Would-be reformers are too prone to shut their eyes to practical difficulties, and it must always be the duty of the legislator to consider carefully the effects of any legislation he may put into force. It is not always possible for the Government to act on all the advice it may receive from the hygienist, lest "the cure may be worse than the disease."

Legislation must proceed step by step and cannot greatly exceed the public opinion of the day, but each step forward makes the public more and more willing to advance yet further along the road leading to perfection. Despite the best

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intentions of our many health enthusiasts, we are no more likely to reach this state of perfection than is the traveller who seeks to secure the proverbial bag of gold hidden at the base of one of the arches of a rainbow : " The nearer we seem to approach, the further off it seems to be."

MILK AND ITS RELATION TO PUBLIC HEALTH, WITH SPECIAL EMPHASIS ON THE VALUE OF VETERINARY SCIENCE IN ENSURING A CLEAN MILK SUPPLY.*

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MILK has frequently been described as a perfect food ; in fact it is the only one substance which supplies all the food requirements of the animal body blended together in the exact proportions necessary for its growth and maintenance. It is, as you all know, essential for the newly born, and the milk best suited for each animal is that produced by its own species, and more especially by its own mother, that is if the mother be healthy. We do not require the medical profession to tell us that the young child is best when fed naturally ; but circumstances, and especially those of modern life, frequently make this impossible, and we have thus to resort to the use of milk produced by animals to feed our children. There can be no doubt that nature only intended human beings to partake of milk until they could be weaned, but from time immemorial mankind in later life has used milk from animals, and its value as a food for people of all ages has become more and more apparent.

Milk from various mammals has for long been, and even yet is, used by man, and the circumstances of each country determines the species of animal chosen for its supply. Thus the Bedouin of the desert milks his camels ; many races subsist largely on goats' milk ; the Laplander obtains his supplies from the reindeer, the Tartar from his mares ; and in many countries, for instance, the Sudan, the ewe is utilised for the supply of milk, and many of the Sudanese sheep produce large quantities of milk like goats. In Great Britain the milk of the ewe was once largely used, but has now been given given up, and no one judges a sheep from its milking propensities provided that it has enough for its own offspring. In eastern countries the buffalo is used for milking purposes to a large extent ; but in Europe, for all practical purposes, milk is derived from cows and goats only, and in Great Britain, when we speak of " milk," it is to cows' milk we refer unless otherwise qualified. The chemical qualities of milk vary in different species, and the constituents differ more or less in their proportions. It is stated that the milk of ruminants possesses certain physical and physiological

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distinctions from that of non-ruminants. This may account for the special virtues attributed to the milk of the mare and she-ass, which is sometimes used for infants and invalids.

But I must not linger on describing the differences in the milk of various animals, nor is it necessary to go into the chemical analysis and food values of milk except to say that milk contains the three chief principles of diet: protein, fat and carbohydrates, as well as a sufficient quantity of mineral salts and the vitamins A, B, C and D. It may seem strange to us, but it is only as recently as 1875 that the British farmer first took to dairy farming as a serious business, and in 1876 the first London Dairy Show was held, and brought about the formation of the "British Dairy Farmers' Association," which has played such an important part in our modern dairying. May I quote from an early publication of the Association, which reproduced from *Household Words* the following tribute to the cow: "If civilised people were ever to lapse into the worship of animals, the cow would certainly be their chief goddess. What a fountain of blessing is the cow. She is the mother of beef, the source of butter, the original cause of cheese, to say nothing of shoe-horns, hair-combs and upper leather. A gentle, amiable, ever-yielding creature, who has no joy in her family affairs which she does not share with man. We rob her of her children that we may rob her of her milk, and we only care for her when the robbing may be perpetrated." I mention this so that you may still keep a soft place in your hearts for this patient animal when later on we are discoursing on her many sins and the multitudinous dangers to mankind which science shows may lurk in her milk. Are not these dangers more due to our greed by expecting too much than to any inherent vice in the cow herself? By modern methods of farming we make the cow into a mere milking and breeding machine, and then expect her to go placidly on, neither deviating to the right nor to the left from the life nature intended her to lead.

The fact that milk is such a perfect food is in itself a danger, for it is an equally perfect medium for the growth of micro-organisms, both pathogenic and non-pathogenic, and it is in the endeavour to prevent these, and especially the former, that the veterinary profession is called upon to play its part in the national campaign for clean milk. We hear a great deal to-day about "clean milk," but too often the term is used merely to denote milk with a low bacterial count, and with but few coliform organisms present. It is too frequently forgotten that co-called clean milk may have a very low bacterial count, and yet have present a large number of living tubercle bacilli or organisms causing contagious abortion in cattle. Both of these, I need not remind my audience, are liable to produce disease in man when such milk is consumed in its raw state. Indeed, it may surprise some of you to be told that milk rich in tubercle bacilli may easily be that which wins the first prize in a "clean milk" competition as practised to-day. In speaking of clean milk, therefore, the term must imply milk not only with a low bacterial count, but also free from disease-giving germs. It thus behoves us to show what the veterinary profession can do to assist in clearing our herds of

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disease, and to eliminate, or at least greatly reduce, the disease-giving organisms in the milk to a minimum. The official veterinary officer employed by a local authority, be he whole- or part-time, has in reality very limited powers in dealing with disease, and these for the most part relate to tuberculosis; but the wise farmer is he who consults his own veterinary adviser as to the best means of dealing with and preventing disease in his stock. The conditions most prevalent to-day, and which cause the greatest loss to dairy farmers, are contagious abortion, mastitis, tuberculosis and Jöhne's disease. Science has now placed in our hands the means by which we can diagnose all these conditions in their early and even latent stages, and it is possible to eliminate each one from any given herd. The trouble is that these conditions are so widespread, and the average owner so complacent about the matter, that he seems to imagine that the losses he suffers are more or less part and parcel of his trade, and he will not bestir himself sufficiently so as to help himself. Moreover, the conditions on most of the farms, and the systems under which dairying and the cattle trade are carried on in this country all mitigate against the radical measures necessary for the elimination of these scourges being taken.

As to the value of milk for growing children, I may refer to the investigation carried out in Scotland in 1930 by the Department of Health for Scotland and the Education Authority of the County of Lanark. The late Chief Medical Officer of the Department of Health, Dr. J. Parlane Kinloch, reported as follows[1]: "Some 20,000 school children were included in the investigation, 10,000 of the children receiving daily a supplementary ration of milk over a period of four months, the remaining 10,000 serving as controls. Bulked Grade A (T.T.) milk was used throughout the test, and in order to investigate the relative values of raw and pasteurised milk, one-half of the milk was pasteurised.

"The results, read along with the results of the previous Scottish test, are conclusive on the main issue. They demonstrated that the addition of milk to the diet of children has a striking effect on improving physique and general health and increasing mental alertness. They suggest also that apart from its own food value, milk enables the other constituents of the ordinary diet to be fully utilised as growth factors. The question of the relative merits of pasteurised and raw milk remains open; but it would appear that pasteurised milk, like separated milk, as a supplementary ration to the usual mixed and variable diet of the household, is a potent growth-producing factor.

"The results give a special significance to the new powers conferred on local authorities by the Education (Scotland) Act, 1930. Under that Act, local authorities may make an additional ration of graded milk available to school children. In view of the results of these Scottish tests, it would be difficult to exaggerate the importance of the new powers. Their universal exercise by all the local authorities would affect about 800,000 children (the total school population in Scotland), and by improving their physical and mental well-being would have a powerful influence in improving the quality of the Scottish race.

Indirectly, by greatly increasing the national consumption of graded milk, it would have another important result. It would lead to the rapid elimination of tuberculosis from the dairy herds of Scotland, and so to the prevention of many of the crippling disabilities from which the population suffer at present."

The coming into being of the Milk for School Children Scheme of the Milk Marketing Board has resulted in a vastly increased consumption of milk in the schools. I have not the figures for the country generally, but in the county area of the West Riding of Yorkshire the consumption went up from approximately 54,500 bottles of a third of a pint a day in October last, to 136,500 bottles per day in December. In Yorkshire the new scheme only commenced on November 1st.

The scope of the veterinary officer in aiding the production of clean milk must largely depend upon the powers granted by Parliament and the manner in which local authorities carry out their obligations. In my previous lecture I traced the growth of the legislation, and mentioned the issuing of the Milk and Dairies Order of 1926. This Order, which applies to England and Wales only, is the chief means by which we can insist on reasonable methods of production. The onus of carrying out the Order differs according to the district, but the whole Order is administered by the Corporation of County Boroughs, and where such have a veterinary department, the chief veterinary officer is frequently responsible for seeing that the conditions are complied with, and in certain cases he has a professional and a lay staff to assist him. In the counties, on the other hand, the onus is chiefly placed on the local sanitary authorities, that is, on the Councils of urban, rural and non-county boroughs. That part of the Order, however, which deals with the health of the cattle is entirely administered by the County Council. This no doubt has been so arranged because the small sanitary districts do not employ veterinary officials. It is thus the duty of the veterinary staffs of the County Councils to examine the cattle used for milk production.

As the veterinary profession is primarily responsible for the treatment and prevention of disease, I will deal with this aspect of their work first. Under our modern regulations there are twelve conditions mentioned as sources of possible danger to the milk supply, and no less than three of these refer to forms of tuberculosis. The list is by no means well drawn up, and calls for revision. One can only conclude that those responsible for drawing up the Order did not consult the veterinary profession before doing so. The diseases specifically named are certain forms of tuberculosis, acute inflammation of the udder, acute mastitis, actinomycosis of the udder, suppuration of the udder, foot-and-mouth disease, anthrax, any septic condition of the uterus, any comatose condition, or any infection of the udder or teats which is likely to convey disease. By far the most important for all practical purposes is tuberculosis. Of all the diseases which cattle are heir to which may be transmitted to man, this is the most important from the public health standpoint. It is not within the scope of this lecture to discuss the enormous pecuniary losses which this disease causes to agriculture, but they are more than sufficient to warrant steps being taken to eradicate the

disease even if the public health were not imperilled. Unfortunately we know that tuberculosis is a very common infection in market milk, and various estimates as to its frequency have been made. This frequency varies according to the district, type of farming and class of cow kept, and, I may add, on the steps taken to keep it down. Savage[2] gives figures showing that in London the average number of infected samples tested in the ten years 1918–1927 was 5.3 per cent., and for Manchester 10.6 per cent. More recently the Department of Health for Scotland carried out extensive tests, and showed that no less than 10 per cent. of raw milk delivered to the four chief Scottish cities in 1933 contained living tubercle bacilli.[3] This result was arrived at after the examination of 1,534 samples. It also showed that no less than 35 out of 1,243 samples of milk pasteurised on commercial lines by the " Holder " method, and probably not sufficiently controlled, contained tubercle bacilli, and when ordinary milk was examined in bulk of 500 gallons or more, about one-third showed this contamination. In 1931, after an exhaustive inquiry, the People's League of Health published a report entitled " A Survey of Tuberculosis of Bovine Origin in Great Britain," in which it was stated that 6.7 per cent. of raw market milk was infected with tuberculosis.[4] Again, Pullinger, working in London in 1934,[5] found that the country milk delivered there was contaminated up to 18 per cent., according to the county of origin. He also found, after testing 63 samples taken from 3,000 gallon rail-tanks, no less than 100 per cent. contained tubercle bacilli. This great discrepancy is explained by the fact that the large tanks contain the mixed milk of so many cows, not less than 1,000, and probably about 1,200, and as it is estimated that about one cow in 500 at any one time may be excreting tubercle bacilli in her milk, there would in all probability be the milk from at least two such cows included in the tank. These figures are very disconcerting and make it the more imperative that steps should be taken to prevent this. The one and only really satisfactory solution to this is the total eradication of tuberculosis from our herds. Formidable as the problem is, we as a profession feel we can do this if opportunty and time were given. The admirable work done in Ayrshire by Dr. L. Jordan, a member of our profession, is proof of this statement.[6] An area of the county of about nine square miles and containing thirty-seven farms was virtually freed from tuberculosis in three years. The scheme was voluntary, and the farmers could enter into it or not as they liked. Three refused to partake of it, two were " Certified," and thus tuberculosis-free, when the scheme commenced, and two finally dropped out. This left 30 farmers who accepted the offer to have tuberculosis cleared out of their herds. At present in England and Wales, according to the last annual report of Sir George Newman, until lately chief medical officer of the Ministry of Health, there were in 1933, 239 " Certified " and 289 " Grade A (Tuberculin Tested)" herds licensed as tuberculosis free. To show the difference of the milk from such herds compared with milk from ordinary herds, the Department of Health of Scotland, in the tests I have just mentioned, found that only one sample of this milk contained tubercle bacilli out of 714 examined. Pullinger[7] reports one sample out of 101 in England to have been tuberculous, and during

the year 1933 only three samples of the milk produced from the 418 licensed tubercle-free herds were found to be contaminated. Theoretically there should be no positive samples at all, but when it is considered that under the terms of the Milk (Special Designations) Order, which in many respects are absurdly lax, the herds may be recruited by the addition of ordinary cows which have passed the tuberculin test once only, and that such herds are too frequently surrounded by herds of infected cattle, it is not to be wondered at that an occasional breakdown occurs. It is also comforting to report that in Scotland, where so much more has been done to produce tubercle-free herds, Wright, of the Hannah Dairy Research Institute,[8] recorded that in 1929, 550 samples of milk from tuberculin-tested herds supplied to Glasgow hospitals were examined by the biological test for tuberculosis, and not one was found to be positive. He states that out of 28,221 tuberculin tests made on the cattle in the licensed herds in Scotland, only 423 cows reacted, which is only 1.5 per cent. of the cows included therein; and as only about 1 per cent. of such reactors can be shown to give tuberculous milk, it follows that the proportion of cows in the licensed herds which may be actively dangerous to the milk supply works out at 1 per cent. of 1.5 per cent., or three cows in every 20,000 animals. The work of clearing out the disease from our tuberculin-tested herds is due to the care and skill of our profession, and both practitioners and county and municipal veterinary officers deserve their share in the success already achieved in this direction. Theirs has been pioneer work, and as the number of tubercle-free herds increases, the task must become easier and the danger of a breakdown in the freed herds correspondingly less. We hear much criticism of tuberculin and tuberculin testing, but we have to-day a highly accurate test capable of detecting the vast majority of infected cattle, however slightly they may be affected. This is neither the time nor the place to discuss the difficulties of the test, for difficulties do exist, and mistakes have been made, and will continue to be made in its application by all of us, however experienced we may be, despite the assertion of a few optimists that they never err. These errors will, however, be fewer in the future when the new methods of testing are better known and understood; but they must not be allowed to deter us, for at the most they should be a mere fraction of the successes obtained. Last week I mentioned the new scheme of the Ministry of Agriculture in conjunction with the Milk Marketing Board for tuberculosis eradication. While welcoming any such scheme one feels that it has but little chance of success in its present form, and that some more tangible prize must be offered than 1*d.* per gallon extra for milk produced by such a herd.

While tuberculosis eradication must be our aim, the ideal cannot be reached for many years to come, and the question now before us is what immediate steps can be taken to reduce the infection present in our milk. To many the general pasteurisation of all milk appeals as a simple and easy solution of our difficulties, but although this may be possible in large cities and towns, it is quite impossible to make it universal or control it in rural or even semi-rural districts. We must also realise that with pasteurisation as practised commercially, tubercle bacilli

still have a way of escaping destruction. In the Scottish inquiry it was found that no less than 2.8 per cent. of milk pasteurised by the "Holder process" contained living tubercle bacilli, which is quite as much as occurs in raw milk in certain districts produced from ordinary commercial herds.

The routine examination of milking cows by veterinary surgeons employed by local authorities has proved of great value in eliminating large numbers of cows with tuberculous udders, and many other open cases of diseased cattle from which tubercle bacilli are being freely expelled from the lungs or otherwise. Although even with quarterly examination of cows we cannot expect entirely to eliminate the disease from milk, we can materially reduce its frequency and shorten the period in which affected cattle are allowed to be kept on the farms. The system has been criticised by some medical men and others, who state that it does nothing to eradicate tuberculosis, as for every cow detected and removed from the herd, several others are probably left which may be sources of danger. They even go further, and suggest that the system is actually dangerous in that it may give a sense of false security and put off the day for more radical measures of control. While to some extent the former assertion is true, the elimination of the grosser forms of infection must be of value, and were the cattle examined all over the country with the same care and skill as they are in some boroughs and counties, the effect would be much greater.

It certainly seems ridiculous that in one area hundreds of tuberculous cows, many even in the early stages, are detected and slaughtered every year, yet in adjacent counties nothing is done and the affected cattle are allowed to remain in milk as long as they can last out, and many are also used for suckling calves, and so infect them. There is no barrier between one district and another, and potential carriers of disease are allowed free entry from district to district. Our critics also state that our work is not 100 per cent. efficient in removing cows dangerous to the milk supply; but what system of medicine, human or veterinary, is perfect? It is difficult to follow the reasoning of those who argue thus, and if every improvement on old methods which is only a gradual one were left undone because the ideal could not immediately be reached, little or no progress could be made in any direction.

The term "clinical examination of cattle" has been, and is still often, much misunderstood, and to a certain extent the term itself may be misleading. It does not refer to a clinical examination alone, but to a careful physical examination of all cows and heifers on the farm, accompanied by the collection of secretions and discharges from any animal which may be suspected. Such materials are milk, sputum, urine, and so on, and the examination may include the use of the tuberculin test when deemed necessary to assist diagnosis. The samples thus collected must be submitted to a bacteriological examination, and this in the first instance should consist of a microscopic examination in preference carried out by the veterinary officer himself. In samples in which he is unable to detect tubercle bacilli, and which he considers worthy of a further test, the biological test should

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be resorted to, and it is absolutely necessary that a properly equipped laboratory should be available, if possible run by the same department.

Great differences of opinion have been expressed as regards the value of the microscopic examination of milk for tubercle bacilli, but as regards bulk samples it is of little or no use; but provided the sample is taken from the quarter of an udder which is enlarged, indurated or otherwise suspicious, I have no hesitation in saying that if the abnormality is tuberculous, an experienced worker should be successful in diagnosing the condition microscopically in at least 90 per cent. of samples without having to await the prolonged biological test. In other words, very few such samples should be returned from the laboratory as tuberculous. The person who examines the cow, takes the sample and examines it, is the best judge as to whether or not it should be submitted to a further test. Knowledge of the type of udder and the general condition of the cow in question, along with the character of the sediment and the cell content after centrifugalisation, is more than half the battle in making this decision, and for this reason I cannot too strongly advocate that each veterinary officer should carry out his own microscopic work. The saving of time by avoiding having to keep the suspected cow from four to six weeks without being able to use her milk, and the saving of the cost of a biological test, are very obvious advantages.

It may not be generally realised by those not familiar with the disease that a cow with tuberculosis of the udder, and consequently giving tuberculous milk, may be in excellent condition, and show no outward sign of disease other than some abnormality of her udder which may easily escape the notice of anyone not an expert. Moreover, a cow may have active pulmonary tuberculosis, and be coughing up living tubercle bacilli, and yet look well and " never miss a meal," as farmers say. It thus requires continual practice to become efficient in picking out such cattle. It may be possible when the disease is well advanced to diagnose tuberculosis on a cursory examination; but in most cases, and practically always in udder tuberculosis, diagnosis can only be satisfactorily arrived at by the demonstration of tubercle bacilli in the milk or other discharge, or by the use of the tuberculin test. I well remember a distinguished physician once saying to me that no doctor could diagnosis tuberculosis in a child on the first visit unless that child was so badly affected as shortly to be going to die; and the same is true, although perhaps to a lesser degree, with cattle. The chief object of the routine veterinary examination of cows is to enable the more dangerous cases of disease to be removed from the herd long before they would be likely to be reported by the farmer, and also to instruct farmers what to look for and what cases to report to the authorities.

I have already in my previous lecture described the type of tuberculous cow which can be dealt with under the Tuberculosis Order, and need only repeat here that it is, when properly administered, of great value, both from an agricultural standpoint and more especially from that of public health. The Tuberculosis Order, it must be realised, is complementary to the Milk and Dairies Order, and

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neither can be satisfactorily administered without the other. To give some idea of what the Order has accomplished, I will give you some figures showing the work done in this direction. In the West Riding of Yorkshire there are about 8,600 registered milk-producing farms. This number includes the farms producing liquid milk, those on which butter is made, and even a few where cheese is manufactured. In two years the veterinary staff paid 34,354 visits to these premises and examined more than 389,750 cattle.[9] As the direct result of these visits we found and removed from the herds 1,312 tuberculous cows so affected as to be amenable to the Tuberculosis Order, 672 of which had tuberculosis of the udder. In addition, in the same period no less than 1,043 tuberculous cattle reported by veterinary surgeons, their owners or otherwise, were likewise slaughtered. This gives a total of 2,355 cattle found to be affected with open tuberculosis, or roughly 0.6 per cent. of the cattle examined. I should explain that the above figures mean that practically every animal producing milk, or potential milk produced in the county, was examined twice in each year. There can also be no doubt that the mere fact of the veterinary staff visiting the farmers regularly causes them to become more careful in the type of cow they buy, and keep more alert in reporting doubtful cases at an earlier stage. Tuberculous cattle will never come to light except in the last stages of disease if the local authorities wait for the reports to be sent in. It is absolutely necessary that they themselves must take active means to search for them. In this connection it should be made clear that the distribution of the disease is by no means uniform, and experience shows that the affected animals occur from year to year on more or less the same premises. In the two years above quoted diseased cattle were only found on about 11 per cent. of the farms visited.

During the years 1932 and 1933 the County Medical Officer of the West Riding reported that 2,017 bulk samples of milk produced in the administrative county area had been submitted to the biological test, and 59, or 2.9 per cent., were found to be tuberculous.[10] This is practically the same proportion as the Scottish test showed for pasteurised milk. Moreover, the samples for the most part were taken from farms in the districts adjacent to the industrial areas or around the larger towns where an older class of cow is kept, and in which the incidence of tuberculosis is expected to be higher than is the case in some of the more rural parts of the county.

There is an ever-increasing tendency for medical officers of health to take samples of milk from various sources and submit them to the biological test. In cases where these prove to be positive it is the statutory duty of the medical officer to inform the veterinary officer in order that he may examine the herd or herds concerned. Here the veterinarian is of the greatest value in detecting the offending animal, and the greater his skill, the greater the chance of his finding the culprit without necessitating the biological examination of milk from all animals in the herd. If, however, the veterinary officer is unsuccessful in tracing the cow responsible by clinical and microscopic means, it entails sampling all

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the cows singly or in groups, and awaiting the four to six weeks necessitated by the biological test. I have figures obtained in the West Riding showing the results of investigating 272 reported tuberculous milk samples. In 42 instances we detected immediately 48 cows giving tuberculous milk, which means with tuberculosis of the udder, and in these cases no further tests were carried out on the grouped milk from the other cows. In the remaining 230 investigations, which involved the examination of 3,882 cows, the clinical finding, whether positive or negative, was controlled by a biological test. The results obtained agreed with the results of the clinical examination of the herds in 89.14 per cent. of the cases, while in 10.86 the biological test was required to locate the offender. Clinical means was sufficient to detect 123 diseased cows in these investigations, while the biological test brought 25 more to light. We must admit, therefore, that the biological test is of use in detecting a percentage of dangerous cows which clinical means may miss, but the test should be looked upon as of secondary importance compared to the work of the clinician, although a very useful aid.

Contagious Abortion.—The question of connecting this disease with those responsible for causing injury to the public health is only of recent origin, and no mention is made of it in the Milk and Dairies legislation. The organism responsible for producing the disease in cattle, *Br. abortus*, has been found to be almost identical with that which causes Malta fever in the Near East, namely, *Br. melitensis*. In recent times it has been shown that the former organism can produce a prolonged and intermittent fever in man known as undulant fever. The number of recorded cases of this fever has increased in the United Kingdom from one in 1917 to 57 in 1932, and 54 in 1933. In the United States it has risen from one in 1922 to 1,545 in 1933.[11] We know that the percentage of farms where contagious abortion exists in cattle is extremely high, and probably about one-third to one-half of the cows on these farms are affected. Now it is also recognised that about one-third of the affected cows excrete the organisms in their milk, and thus it cannot be satisfactorily explained why the number of human cases is so small. As there are methods of contracting the disease other than by drinking milk from infected herds, we can only conclude that the danger of the spread of undulant fever by the milk is extremely remote. While not wishing to minimise its importance, one is forced to the conclusion that the disease is one about which we need not be unduly alarmed.

It is known that market milk may be affected with the bacilli of contagious abortion, and Minett and Pullinger[12] reported that 39 per cent. of ordinary market milk from single farms sold in London was found to be contaminated.

As a means of detecting contagious abortion, the clinical examination of cows is useless, for to arrive at a correct diagnosis it is necessary to have an agglutination or a complement fixation test carried out on each animal. There are three ways of dealing with the disease in a herd : the first being by having blood tests carried out on all animals which comprise the herd, combined with strict isolation of the reactors, and their gradual elimination until the herd becomes free. This

must entail the frequent re-examination of the blood from time to time, and the careful rearing of young stock so as to avoid their being re-infected. This is the only means by which we can hope to eradicate the disease once it has gained a footing amongst the cattle, or which is of any value from the public health standpoint. Should it be found on further investigation that undulant fever in man is more frequent than we now imagine, it may be necessary to insist on abortion-free herds as well as tuberculosis-free.

The second manner of dealing with the disease in cattle is by means of the live vaccine. This, however, does nothing to lessen the degree in which the milk is infected, as it keeps up the infection amongst the herd. In fact some go the length of stating that the milk may be infected as the direct result of the injection of the vaccine. The third method is by the use of dead vaccine, which, unlike the live one, may be inoculated at any period whether the cow is pregnant or not. It has a very limited value, and many even assert that it does nothing to lessen the number of abortions in the herd, and certainly it has no effect on the milk supply. The veterinary profession, by team work between the field and the laboratory workers, has within its power the complete eradication of this disease, but is hindered by the lack of appreciation on the part of cattle owners of its necessity, and the expense involved. Fortunately some far-sighted owners do exist who have taken steps to clear the disease out of their herds, but we cannot expect to make much headway without Government control.

Mastitis.—I now come to the consideration of mastitis, " garget " or " felon," as it is called amongst the farming community. From the purely commercial side of the milk industry there is no disease which causes so much loss, other than perhaps abortion. Mastitis is found in nearly every commercial herd, and on the clinical examination of milk cows it is astounding and distressing to note the large number of " blind," " light," and indurated quarters indicative of old-standing mastitis, as well as those where it is acute. Bacteriological examination of milk has also shown that many udders harbour the organisms of streptococcic mastitis, and yet show no clinical or other manifestations of the trouble.

Minett has also shown that the difference in the milk yield from an ordinary herd where mastitis exists is very marked from that of the herd which is mastitis-free, to the detriment, of course, of the former, other factors being equal.[13] He also showed, if proof were even needed, that the streptococci were almost universally present in ordinary market milk. There are, apart from tuberculous and actinomycotic mastitis, three forms commonly found ; the first and by far the most common being streptococcal ; the second due to staphylococci ; and the third due to a diphtheroid organism known as *B. pyogenes*. Fortunately the common types are harmless to man. The one dangerous type is a hæmolytic organism, which is often of human origin, in the cow. This fortunately is rare. In some cases, although not always, this type of organism produces abnormalities in the udders of affected cows, but bacteriological means are always required to confirm diagnosis. The veterinary surgeon can be of the greatest value to the farmer in

advising him how to treat and minimise the cases, and if the owner is willing to allow samples to be tested at a laboratory, he can ascertain exactly which cows are affected and are acting as carriers. This includes the clinical and the non-clinical ones. May I quote from an article by Minett, Stableforth and Edwards.[14] " Observations covering a five years period were made in a practically self-contained herd consisting of 53 cows and heifers, of which, in June, 1928, 10 were affected with chronic streptococcus mastitis. Preventive measures, in which, during the first two years, the infected cows were milked last and subsequently kept on separate premises, have led to the formation of a group of cows which for three years and six months has remained free from the streptococci which cause the chronic and contagious form of mastitis. Of the ten originally infected cows, two stayed on the farm for over four years ; four for between two and three years ; and four for varying periods up to two years. Two other infected cows were located later. Altogether, five of those which were under observation for the longest time appeared to have made a complete recovery. . . .

" So far as can be judged from the literature, this is the first time it has been conclusively shown by frequent and searching tests of the milk that a herd of cows can be maintained free from infection. This constitutes the final proof that chronic streptococcus mastitis is a contagious disease, and therefore theoretically preventable." If this is theoretically preventable, it must be possible to discover some practical means to arrive at the same result, and it is the duty of our profession to find it.

Of the other diseases of cows scheduled under the milk and dairies legislation I need say but little. I refer to such conditions as anthrax and foot-and-mouth disease, which are well looked after by the Diseases of Animals Acts and Orders, which it is the duty of the veterinarian to administer. There is also the retention of the placental membranes after calving, which condition is readily noted, and but few farmers are likely to use milk from cows in such a condition. The veterinary officer inspecting cows has also a discretionary power to prohibit the use of the milk from any cow showing disease of the udder or teats which is likely to convey disease. The definition is rather vague, and leaves much to the judgment of the individual officer.

Having discussed some of the diseases which may adversely affect the milk supply, and how the veterinarian can assist in their control, let us now look at the benefits of regular veterinary supervision on more general lines. The Milk and Dairies Order is so framed as to place the administration of most of its clauses on the local sanitary council so far as the counties are concerned. These are frequently small bodies who cannot afford to pay enough to engage the services of a competent sanitary inspector, so that where this is the case the supervision of the milk supply is next to *nil.* When the Local Government Act of 1929 fully comes into force, and the amalgamation of many of the unsatisfactory districts has been carried out, this difficulty will be to a great extent got over. In other districts, however, great interest is taken in the question of milk supply, and the

local officials are very active. I have found that in some areas the local officials are keen, but their councils, who are their employers, will not back them up, and they cannot obtain the improvements they desire. In any case, be this as it may, the interpretation placed on the Order is varied and irregular. I cannot say how many local authorities there are in England and Wales, but in the West Riding alone there are no less than 147, not even including the county boroughs, who, of course, are independent of the county. If the county council is wise enough to arrange for the veterinary examination of the cows in its area, the veterinary staff who visit the farms can do a great deal to bring about some sort of uniformity of control, although it may not be as uniform as one would desire. If the visits are arranged as far as possible to be made along with the local sanitary inspectors of the various districts, the two officials working together can command much more attention than can the local official alone, and more especially if one happens to be a member of the county staff. The county council has supervisory powers over the sanitary districts in its area, and can put much moral, if not legal, pressure on them. If they fail in their duties under the milk legislation the county can ask the Minister of Health to transfer the powers from the local council to that of the county. The veterinary officer is the only county official who must visit all the farms, and it stands to reason that when such visits are being made the local officials put their best foot foremost, which means that they take more interest in their work. The veterinary officer can give much good advice concerning the construction of buildings, such as the cowsheds, milk houses and so on. In the West Riding it is my custom to report to the clerk of the council on the condition of the cattle, cowsheds, methods of milk production, the cleanliness of the cattle and premises, and so on, after each tour of inspection in any one district has been completed. These reports are forwarded through the county clerk to the clerks of the local councils, and are read at the public health meetings of these bodies. Copies of the reports are also enclosed for the local medical officer of health and for the sanitary inspector for their information. In districts where there are whole-time medical officers I send my report directly to him, and not through the clerk of the council. These regular reports have done, and are doing, much to stimulate better methods, and as lists of unsatisfactory producers and premises are appended, it focusses attention on those who need it most.

The present laws dealing with animals, their management and their diseases, are nothing more or less than chaotic in this country. Responsibility is too much divided and split up between the Ministry of Agriculture, the Ministry of Health, the county councils, the councils of county and non-county boroughs, and even those of the rural and urban districts. The question of a clean and safe milk supply cannot be divorced from that of the health of the animals and the control of disease in general. If a question is raised as to the state of the cattle or the cowsheds on any given farm, it is to the medical officer that it is addressed if it goes through the usual official channels, and yet this officer has in all probability never been to the farm, knows nothing about the cows, and cannot be ex-

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pected to take any interest in them. What could be more absurd than this? The Cattle Diseases Committee of the Economic Advisory Council published a long and exhaustive report last year, and put forward many sound suggestions for administrative improvement, although one cannot agree with all of them. To bring about improvements long overdue, and to give the veterinary profession the position and chance it is willing and ready to take up, the country ought to demand the necessary alterations in the law. The most difficult problem, which is causing much difference of opinion at the moment, is whether or not there should be complete State control, and whether all ordinances dealing with animal diseases and the milk supply should be run by a State service, or, conversely, if the present system of local government should be extended and improved. On paper, and theoretically, a State service appears the best, but I for one have still to be convinced that the extinction of local government is desirable. If for veterinary control, why not for the control of human disease, and have only a State medical service, and cut out local government in this direction? I hardly think public opinion would permit of this.

Even without new legislation each county council and each county borough should have an independent veterinary department, and their duties, including those connected with the milk supply, should be clearly defined. Such duties should be made statutory rather than be left to the discretion of local councils under the unfortunate word " may " rather than " shall." Where we are especially lacking to-day is in respect of suitable laboratory accommodation where veterinary bacteriological examinations can be carried out both for the practitioner and those working in veterinary public health. Where laboratories are provided by local authorities these are mostly medical, and any veterinary work is too liable to be given second place or not done at all. To deal adequately with the diseases of dairy cattle, especially those connected with the milk supply, without laboratory help, is like the ancient problem of the Egyptians trying to make bricks without straw.

So far we have merely touched the fringe of what is required of the veterinary profession in dealing with animal disease, but I trust that I have been able to show at least some of the activities by which we are able to help in improving the milk supply of the country, and at the same time prove a blessing to agriculture and to those whose livelihoods depend upon it. If we are able to do so we may rest assured that the general public will be the gainers also, in so far as the public health is concerned.

REFERENCES.

[1] "Milk Consumption and the Growth of School Children." Report published by the Department of Health for Scotland, 1930.

[2] Savage: " The Prevention of Human Tuberculosis of Bovine Origin," 1929, p. 48.

[3] " Tuberculous Infection in Milk." A Report by the Department of Health for Scotland. Medical Research Council, 1933.

[4] " A Survey of Tuberculosis of Bovine Origin in Great Britain." The People's League of Health, 1932.

[5] Pullinger, E. J.: *The Lancet*, May 5th, 1934, p. 967.

[6] "The Eradication of Bovine Tuberculosis." Published by the Medical Research Council, 1933.
[7] Pullinger, E. J.: *see* Ref. 5.
[8] Wright, Norman C.: "The Incidence of Tuberculous Infection in the Milk Supplies of the Scottish Cities." *Brit. Med. Journ.*, Sept., 1929, p. 452.
[9] County Council of the West Riding of Yorkshire, Veterinary Department, Annual Reports for 1932–33 and 1933–34.
[10] County Council of the West Riding of Yorkshire: Forty-fourth and Forty-fifth Annual Reports of the County Medical Officer, 1932 and 1933.
[11] Ministry of Health: Annual Report of the Chief Medical Officer for the Year 1933, p. 172.
[12] Minett, F. C., and Pullinger, E. J.: "Disease-Producing Organisms in Milk." *Journ. of the Soc. of Chemical Industry*, Nov., 1933, pp. 379T and 383T.
[13] Minett, F. C.: (Private Communication).
[14] Minett, F. C., Stableforth, A. W., and Edwards, F. J.: *Journ. of Comp. Path. & Therap.*, 1933, vol. xlvi, p. 138.

THE EPIDEMIOLOGY OF FOWL PARALYSIS AS AN INDICATION OF ITS MODE OF TRANSMISSION.

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WHEN a diagnosis of fowl paralysis has been made from post-mortem examinations at this laboratory it has been noticed on many occasions that the history gives a very striking indication of the manner in which the disease has been introduced to the farm. The owners of some of these farms, within a convenient distance of the laboratory, were asked to co-operate in collecting reliable information connected with the history of the outbreak on their farms. This was freely conceded, and assistance was obtained to inspect the stock, consult farm accounts and records, and to carry out post-mortem examinations. An attempt has been made not to include data where it has been necessary to depend on the owner's memory or judgment for them. Such data as the owner's estimate of mortality were confirmed by consulting accounts for eggs or day-old chicks and counting the stock, allowance being made for mortality as chicks according to the owner's figures or estimate.

In the first instance the disease was diagnosed during the course of routine post-mortem examinations. In this work histological examinations were seldom made, and a diagnosis of fowl paralysis was given when macroscopic enlargement of nerves or plexuses was found in conjunction with a history of several cases of lameness and paralysis in the flock. The presence of neoplasms was only accepted as an indication of fowl paralysis when the history was extremely typical, and when no evidence of other disease was found.

Farm 1.—Data obtained from the owner of this farm may be regarded as reliable, and most of the information has been confirmed by personal observation. The land has not, to the owner's knowledge, been occupied by poultry for a number of years. Eggs and day-old chicks were bought in April, 1932. Some of these were obtained from a farm where fowl paralysis is known to exist. Two

hundred and ten pullets were alive in October of that year, and from then until July, 1933, this stock was reduced to 150, mainly by a disease which, from the owner's description, was typical fowl paralysis. From July to October, 1933, that is between the ages of fourteen and eighteen months, twelve of these birds died, or were killed in an advanced stage of disease, and post-mortem examinations were made. There were macroscopic lesions in nerves in two, neoplasms in three, enlargement, probably neoplasmic, in the liver in one, advanced paralysis with no macroscopic lesions in two, depigmentation of the iris and emaciation in one, while in the remaining three symptoms were not characteristic and lesions were absent. The nature of the lesions in the nerves was confirmed by histological examination. At the end of this period the birds were eighteen months old, and from this time until they were twenty-six months old no more evidence of fowl paralysis was discovered, mortality was low and the birds were in good condition and laid well. All birds that died during this period were examined, and a satisfactory explanation of the bird's death was discovered in each case.

During the spring of 1933, when the disease was at its height in the above birds, eggs from them were hatched, and 500 pullets were reared. These pullets were under observation between the ages of four and fifteen months, and all birds which died were examined. Throughout this period mortality was low, and fowl paralysis was never suspected. They were under the owner's observation until over two years old, and he did not observe abnormal mortality or symptoms of fowl paralysis. It is interesting to note that 100 of these pullets were on land which had been occupied by the affected parent stock. The birds on this farm were in slatted-floor houses on free range.

Farm 2.—No poultry had been kept on this farm for thirty years. In the spring of 1933, 108 chicks of both sexes were hatched from eggs bought from farm A, and 226 from eggs from source B. A total of about 150 pullets were reared. They were mixed and placed in arks with slatted floors. Forty of them died between the ages of five and sixteen months, and the symptoms described by the owner correspond to those of fowl paralysis. A post-mortem examination of the first six cases was made: duodenal coccidiosis was diagnosed in one, fowl paralysis was diagnosed from nerve enlargement in two cases, neoplasms were discovered in one; the other two showed limb paralysis, but no macroscopic lesions. The owner affirmed that the disease was confined to birds purchased from source B. Fowl paralysis was diagnosed by post-mortem examination, and is known to have been prevalent on that farm at the time the eggs were purchased. The birds from the two sources were distinguishable, and the six birds examined were from source B. Between the ages of sixteen months and two years no more mortality occurred, and the birds from source B were superior in general health and stamina to those from the other source.

Farm 3.—From the history and from the discovery of an ovarian tumour, fowl paralysis was diagnosed in July, 1933. Three birds were examined in July, 1934. A large tumour occupying the greater part of the thorax was found in

one and enlargement of the sciatic nerve in the other two. Birds are kept for laying and for fattening, sex-linked or sex-determined day-old chicks being purchased. As there is no suspicion that fowl paralysis has ever occurred in the table poultry, and as these leave the farm before reaching the age at which fowl paralysis usually appears, they are not considered here. The farm was established in December, 1932, on land which had not, to the owner's knowledge, supported poultry before. Stock for 1933 was bought as follows: Source A: 100 sex-linked day-old chicks. Source B: 150 sex-linked day-old chicks. Source C: 50 pure-bred day-old chicks, of which 24 were pullets and were kept.

The birds from these three sources were mixed on free range, and no attempt was made to separate them. The birds from sources A and C remained healthy, and no abnormal loss was sustained. They were observed by us as two-year-old birds in good condition. An outbreak of disease with symptoms corresponding to those of fowl paralysis caused the death of twelve of the birds from source B when they were between four and five months old. One of these, examined by us, revealed a neoplasm involving the ovary. No further evidence of the disease was observed in these.

In 1934, 1,000 sex-determined chicks were bought from source D and placed on land which had not been occupied in 1933. This source is the same as that designated B in connection with the severe outbreak of fowl paralysis on Farm 5. These birds were intended for sale as four months old laying pullets, but a number of them died, or were killed in the final stages of fowl paralysis before reaching this age. Two hundred of them were sold to five purchasers in different parts of England, and complaints that the birds had become diseased were received from four of them. Of the 800 (*less* normal losses as chicks) left on the farm, only 300 survived to nine months; the total mortality may therefore be estimated as being above 50 per cent. Four hundred cockerels, intended for table purposes, were bought at the same time and reared with the above. To the owner, the most outstanding feature of the 1934 outbreak was that these cockerels remained healthy at a time when losses were very numerous in the pullets.

Farm 4.—The farm was established in the spring of 1932. Prior to the owner's occupation a few birds had been kept around the house. Four hundred and fifty Leghorn eggs from source A, and 500 Wyandotte eggs from source B were purchased for hatching. The Wyandotte pullets remained healthy, and were sold at the end of their first year. Twelve of the Leghorns suffered from a disease with symptoms typical of fowl paralysis. The disease was diagnosed by post-mortem examination by a number of laboratories. Three birds examined by us revealed enlargement of the liver in one, abdominal neoplasm in one, and symptoms, but no macroscopic lesions, in the third. The progeny of these birds, from first and second year eggs, were entirely satisfactory from an economical point of view, but in one bird received for post-mortem examination neoplasm was diagnosed. The owner was of opinion that the disease had not appeared in them.

Farm 5.—In the spring of 1932, the owner acquired 480 two months old pullets and placed them in groups of 120 in four slatted-floor houses on free range. When the birds were three months old a disease with symptoms characteristic of fowl paralysis appeared, and by the end of the first laying period only 200 remained; these remained healthy during the second laying period. None of these birds was examined by us, but there is little doubt about the identity of the disease.

In the spring of 1933, stock was purchased as follows: Four hundred day-old chicks from source A. Inquiries at this farm convinced the owner that no disease resembling fowl paralysis had occurred there, and that the only purchase made for a number of years were stock cockerels; these had always been purchased from the same source. One hundred and thirty eggs from source B. The owner believes that fowl paralysis exists on this farm. One hundred day-old chicks from source C. This was a commercial undertaking which purchased eggs for hatching. Chicks from the three sources were kept separate while in hoovers, and were then distributed in five slatted-floor houses on free-range.

House No. 1 contained 200 birds from source A. This house had been occupied by the diseased birds during the previous year, but had been cleaned and moved a short distance within the field. Some of these birds mixed with those from sources B and C at feeding time, and were in adjacent houses on free range during the whole year. Fowl paralysis was never suspected in these birds.

House No. 2 also contained 200 birds from source A, but was a new house, and was on a remote field. These also remained healthy.

Houses Nos. 3 and 4 each contained 80 to 90 chicks from sources B and C, and were on the same field as house No. 1. These houses had been occupied by diseased birds during the previous year. Over 50 per cent. of these birds were lost, mainly from fowl paralysis. Six of these birds were obtained for demonstration purposes, and only two were killed for examination. Enlargement of the sciatic nerve was noted in one, and a neoplasm involving the kidney in the other.

Houses Nos. 5 and 6 were new houses in a remote field, and each contained thirty birds from sources B and C. Over 50 per cent. of these were also lost from fowl paralysis.

In 1934 the farm was stocked with day-old chicks from source A. The housing system was changed, the fold system being adopted; but some of the folds were moved over land occupied by affected birds during the previous season. These were under observation until over a year old, but no evidence of fowl paralysis was seen.

Thus the birds from source A remained healthy when on land previously occupied by infected birds, while in daily contact with birds in all stages of the disease, and when on a remote part of the farm which had not been occupied by fowls before. Birds from sources B and C developed the disease and suffered a mortality of over 50 per cent. when on land previously occupied by infected birds and when on a remote field away from all sources of infection other than possible contamination by attendants.

XUM

Farm 6.—This was a large farm, and 4,000 to 5,000 birds are kept. Until 1931, these consisted of Leghorns, Light Sussex and Rhode Island Reds.

A diagnosis was made from symptoms and from macroscopic and microscopic lesions in nerves in October, 1932; at this time, and for at least a year before, heavy losses were suffered from tapeworms, ascarids, intestinal capillaria, duodenal coccidiosis and blackhead.

The history obtained from the owner was as follows: Two hundred and sixty Wyandotte pullets were reared from day-old chicks bought in March, 1931. As these were intended for use as foundation stock they were at first kept in enclosures (semi-intensive), but when they were three months old they were deemed useless for this purpose and were placed on free range, in contact with birds of the other three varieties. Fowl paralysis first appeared in the Wyandottes. The only other birds purchased were cockerels for breeding purposes, but these had been purchased from several sources. When a laboratory diagnosis was made in October, 1932, all breeds appeared to be equally affected. Owing to the number of birds kept and the fact that they were not in self-contained units, it was found impossible to verify the information volunteered by the owner. The first appearance of the disease in the Wyandottes is probably the only evidence that can be accepted even tentatively.

Farm 7.—This farm had been carried on with marked success for five years, and during that period no unusual mortality had occurred. It consisted of a two-acre paddock with a large fowl-house, and a smaller fowl-house in each of two adjacent fields. In February, 1932, eggs for hatching were bought from two sources—A and B. These were different breeds, and easily distinguished. At the time of this investigation, namely, in October, 1933, birds were eight months old, and were distributed as follows: One hundred pullets from source A, and 100 from source B, cohabitating in the paddock and sharing one house. Fifty pullets from source A in the corner of an adjacent field. Approximately 50 two-year-old hens in the corner of another adjacent field. The hens were healthy and no disease had appeared in them. The 50 pullets from source A, and which were by themselves, were also healthy, and no losses had been sustained in them. Of the 200 birds in the paddock, 18 to 20 died between the ages of five and nine months, and these birds were all from source B. Four of these were examined, and neoplasm involving the ovary observed in two, and macroscopic enlargement of the brachial plexus and sciatic nerve respectively in the other two. In the birds not examined the symptoms as described by the owner were typical of fowl paralysis. Data regarding the subsequent history of this outbreak are not available in full, but the owner informed us in March, 1933, that up to that time the birds from source A had remained healthy.

Summary.—The histories of outbreaks of fowl paralysis on seven farms have been investigated. Five of these farms were newly established with new equipment, and the birds in which the disease appeared were the first occupants of the land and buildings. All five farms had been stocked by purchasing hatching

eggs or day-old chicks, and no adult stock had been purchased prior to the appearance of the disease. In five instances the farms had been stocked from two or more sources. These two sources could be traced, either by difference of breed or by rings on the limbs. In all five cases birds from one source remained healthy in spite of the fact that degrees of contact included cohabitation as chicks, occupation of land previously occupied by affected birds, contact on free range and cohabitation in an overcrowded house.

In two outbreaks the facts were further confirmed because the owners had unintentionally provided control groups away from the in-contact groups; in Farm No. 7, 50 birds from the source which provided the healthy birds had been placed in isolation, and they too remained healthy; while in Farm No. 5 birds from both sources had been isolated, and again the disease appeared as in the in-contact groups.

The outbreak on Farm No. 1 was investigated in detail because the owner consented to use eggs from the diseased flock for hatching. The eggs hatched were obtained when the birds were pullets, and when the disease was at its height. Fowl paralysis was never observed in 500 pullets raised from these eggs. On another farm (No. 4) where the disease affected a small number of birds, one of the progeny was examined and neoplasm diagnosed; but if fowl paralysis occurred in these birds it was not of economical importance.

On Farm No. 6, the history was complicated by the presence of other diseases, the size of the farm, and the purchase of cockerels. The owner was of opinion that the disease had appeared following the purchase of day-old chicks.

Conclusion.—The following tentative conclusions may be drawn, but consideration must be given to the fact that the flocks were not under continuous observation. There appears to be no factor in the feeding or management of a flock which determines the appearance of fowl paralysis in it. It has been impossible to find any evidence that the disease is transmitted by contact. Evidence obtained on one farm indicated that infected pullets do not transmit the disease to their progeny. The appearance of fowl paralysis in a flock appears to be related to some factor which exists in the parent stock. Valuable information concerning the ætiology of fowl paralysis might be obtained from a study of the transmission of the disease from one farm to another; an investigation of this nature should be carried out on small newly established farms.

TETANY IN CALVES

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In various countries tetany of calves is known to occur especially after feeding them on milk. The disease is usually fatal. The initial signs are nervousness and irritability. Later, convulsions and abnormal movement (*i.e.*, turning round in a circle) are some of the most common symptoms. On post-mortem examination

degeneration of some of the muscles, especially of the musculus quadriceps, is found. The flesh is degenerated on account of an intramuscular œdema. Also hæmorrhages in and on the muscles occur. These calves have a tendency to lick, probably due to lack of iron and copper in the milk. Since we studied some years ago grass tetany in cows, we tried to get blood of calves suffering from tetany, but only succeeded in analysing a few samples. We give the results in the table, together with those of five samples of blood serum from healthy calves —three fat and two lean—withdrawn at the slaughter-house.

TABLE.*

		Ca	P	Mg	Cholesterol	Ca/Mg	Sugar (whole blood)	Acetone (whole blood)
Blood serum in tetany	1931*a*	8.4	16.5†	3.7	—	2.3	—	—
	1931*b*	15.4	11.2†	2.1	—	7.5	126	77.4§
	1932	12.7	10.4	1.22	—	10.4	—	—
	1933	10.85	5.63	0.6	—	18.1	—	—
of normal fat calves	1932*a*	11.1	8.7	1.65	524	6.7	80	45
	1932*b*	10.6	9.7	1.75	561	6	71	42
	1935	12.1	8.2	2	—	6	—	—
of normal lean calves	1932*a*	10.6	7.4	2.2‡	362	4.8	86	45
	1932*b*	10.6	7.9	1.9	302	5.6	86	31

* The figures give the Mg. percentages (Mg. in 100 cc.m.).
† These samples were taken after death, therefore percentage figures are of little value.
‡ The lean calves were about half a year old ; the fat ones about three months.
§ Here the acetone bodies (v. Slijke) were determined in the serum ; in the four others in whole blood.

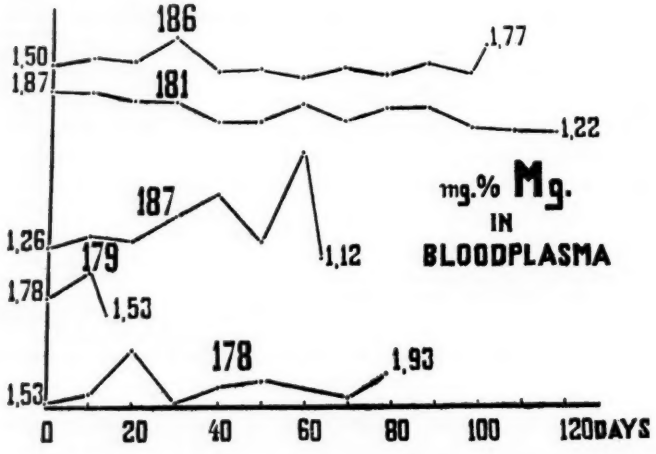
From these data it may be concluded that in tetany of calves there is a disturbance of the mineral metabolism, and perhaps also of that of the carbohydrates (only one figure). The amounts of Ca and Mg in the blood are in some cases too high, in others too low, in a few cases the amount of one of the two elements was normal ; the Ca/Mg ratios differ in both directions from those of normal calves. The amount of Mg in the serum of the fat calves was lower than in those of the lean ones ; the Ca/Mg ratios are wider in the serum of the former.*

In a recent paper, Duncan, Huffman and Robinson† give their very interesting results of the analyses of blood plasma from twenty-five calves continuously fed with milk. They all manifested tetany, which was fatal in twenty-three cases. " The rations were always milk alone or milk with such supplements as cod-liver oil, syrups of iron phosphate, parathormone, or a mineral mixture containing iron, copper and manganese."

In the plasma of twenty calves the calcium and inorganic phosphorus were determined, but no magnesium ; in the plasma of five other calves the amounts

* *J. Biol. Chem.*, **108**, 35, 1935.
† In former experiments we often found great physiological variations of the inorganic phosphorus values of blood of cows and heifers, therefore we do not discuss the percentage values.

of the three minerals were estimated, together with those of Ca and Mg. From these five calves samples of plasma were analysed every ten days. The results with the twenty calves were not very striking: no low calcium; only in some cases high values (*i.e.*, 13.3 and 14.3 mg. per cent.), and some low values for inorganic phosphorus (*i.e.*, 3.95 and 4.81). The calcium values of the other five calves do not differ from those just mentioned; the lowest amount of inorganic phosphorus was here 5.48. The magnesium values they found were low. They conclude: "It is of importance to note that the plasma calcium and inorganic phosphorus values are well within the normal range, but that low plasma magnesium values are a constant finding." According to their opinion 2.25–2.75 mg.



per cent. of magnesium is normal. They found in the plasma of these calves between 1.2 and 1.6 mg. per cent., and Ca/Mg ratio of 8 : 1 to 10 : 1 instead of the normal ration of 4 : 1 to 5 : 1. Most of their animals died after having been fed with milk for several months, sometimes more than a year; only two died within four months.

In 1926 Huffman and Robinson* published results of experiments with calves also fed with milk. In nine of the fourteen calves convulsions were observed. Of the blood withdrawn during the attacks, the plasma had usually low Ca values, about 8 mg. per cent.; once only about 4 mg. per cent. Here the authors concluded that: "The symptoms are accompanied by a lowering of the calcium content of the blood."

Duncan and associates distinguish cases of tetany in calves having low blood magnesium and those with low blood calcium. Our findings and theirs agree in this point, though our variations are greater. In their summary they do not

* *J. Biol. Chem.*, **69**, 101 (1926).

mention their interpretation of the hypomagnesium they found. Yet they call the disease " magnesium deficiency " or " magnesium disturbance," and in the discussion they accept a failure in the Mg metabolism which prevents the animals from utilising the available Mg. They agree with Kruse, Orent and McCollum* considering Mg deficiency to be the only reason of hypomagnesium.† In this paper we will try to furnish evidence that tetany of calves is not caused by Mg deficiency ; but that it is a disturbance of the balance in which the minerals play a rôle. Duncan and associates gave no proofs for the faulty absorption of Mg. They did not analyse fæces and urine. They believe that the amount of Mg in milk is small. But the Ca/Mg ratio of milk is about 11 : 1, while in the body of a fat calf this ratio was found to be (Lawes and Gilbert) 27 : 1 ; so there is in milk a surplus of Mg in comparison to Ca. Two further reasons may be mentioned in accepting a sufficient supply of Mg in milk for calves. In bone, the tissue that contains by far the greatest amount of Ca and Mg of the whole body, the Ca/Mg ratio is about 40 : 1.‡

Buckner and Peter§ found the percentage of Ca and Mg in the ash of young rats (fourteenth to two hundred and eightieth day) to be constant, *i.e.*, 25.4 per cent. Ca, and 1.3 per cent. Mg ; a ratio of 19.5 : 1. Moreover, the results of Duncan and associates show that those animals that had the highest daily Mg intake suffered convulsions at an earlier period than those with a smaller Mg intake. From this fact it may be concluded that those animals which drink the smallest quantity of milk live longest.

There are still more features in their results which make it probable that tetany of calves is a disturbance without deficiency of Mg. If Mg deficiency was the real cause of tetany of these calves one might expect a more or less regular decrease of the amount of magnesium in the blood plasma. Such a decrease did occur in only one of the five cases (calf 181) ; but this decrease probably was normal, as the magnesium value of young calves is about 2.25 to 2.75 mg. per cent., and that of calves of nine to ten months, according to our findings, about 1.6 to 1.8 mg. per cent. The most striking feature of the magnesium values are their large fluctuations, as is shown in the curves of the figure.

With some of the calves the highest values were found at the end of their lives (calves 179 and 187). With calf 187 the decrease during the last four days was

* *J. Biol. Chem.*, **100**, 603, 1933. The importance of low-blood Mg in tetany is known since 1930. In that year Dr. Seekles and I published that in grass tetany of cows the average Mg values were 0.5 mg. (normal 1.3–2) in 100 c.c. serum, and the Ca/Mg ratio about 14 (normal about 5.6). *Biochem. Zeitschrift*, **229**, 358, 1930. *See* also *Nutr. Abstr. and Rev.* I, 628, 1932. So Kruse and associates were not the first to find (1933) that in some forms of tetany a very low amount of Mg and very wide Ca/Mg ratios in serum of animals is the most striking feature. In the cases of tetany studied by Kruse and associates, Mg deficiency was the cause ; in grass tetany of cows there is no Mg deficiency.

† One of the facts that controvert the view that low Mg values are always due to Mg deficiency is that grass tetany often occurs some weeks after a cow has suffered from milk fever. The first disease is characterised by high, the latter by low, Mg values. Alsó the permanent recovery by one injection of Ca and Mg is incompatible with the hypothesis of Mg deficiency.

‡ Oppenheimer : *Handbuch Biochemie*, vol. i, 1925.

§ *J. Biol. Chem.*, **57**, 285, 1923.

very sharp—from the highest to the lowest of all the published values. Also calf 179 shows a high value (2.16 mg. per cent.) four days before death, and a low one (1.53) at the time of the fatal convulsion. Of calf 178, the magnesium value just prior to death was rather high (1.93 mg. per cent.) ; higher than those in the samples from the preceding fifty-nine days.* These variations are a sign of a labile state in these cases of latent tetany, the precursor of manifest tetany. The existence of this condition may also be deduced from what Duncan and associates say : " At times it was possible to precipitate a convulsion during bleeding or when leading a calf from one stall to another."

There is no evidence from the results obtained that the mineral disturbance nor the tetany is due to magnesium deficiency. This labile state is probably due to an intoxication, of which only the milk can be the cause. The milk fat cannot be the origin, since feeding with skim milk too produces this disease. It is improbable that the anæmia of these calves, due to the very small amounts of iron and copper in milk, has to do with the tetany of calves ; nor is there any reason to accuse the milk sugar or the minerals of milk ; on the other hand, we believe that the proteins of milk may be suspected. For this we have the following grounds :

The percentage of proteins in milk is adequate for the first weeks; when, however, the calves get older the nutritive ratio of milk, 1 to 3.6, is too narrow ; the animals consume much more protein than they require ; they are over-fed with proteins. Such a condition easily gives rise to disturbances accompanied by alterations in the minerals of the blood serum, as was shown by experiments Dr. Seekles and I made with cows.‡ The administration of rather large quantities of peanut meal, soya or gluten of wheat gave rise to disturbances of the mineral metabolism, which resembled very much those of tetany in calves. We found fluctuations of the magnesium values from 2.5 to 1.7, from 2.2 to 1.9, afterwards rising to 2.7 ; from 2.8 to 1.8, and then to 2.9 mg. per cent. ; the decreases of the serum magnesium amounted from 22 to 36 per cent. of the initial values.

The blood calcium values were sometimes decreased, but not always, just as in tetany of calves. Sometimes both the calcium and magnesium values were reduced. Wheat gluten in a relatively low quantity decreased only the magnesium, but in a larger quantity both magnesium and calcium.

With soya meal the calcium value was in one case 8.7, with peanut meal 6 mg. per cent. The amounts of magnesium and calcium in the urine fluctuated strongly. The non-protein nitrogen of the blood serum, especially the amino-acids and polypeptids, were considerably increased. Instead of the normal values of about 20 we found 50 and even more mg. per cent. We had no opportunity to determine the non-protein nitrogen in the blood of calves in convulsion. Also

* High values in this case and in some others during or shortly after convulsions were probably caused by the convulsions themselves. Dr. Seekles and I found this influence some years ago (*Biochem. Zeitschrift*, **229**, 358, 1930).

‡ *Arch. f. wissenschaftl. und prakt. Tierheilkunde*, **66**, 60, 1933 ; and *Acta Veter. Neerl.*, I, fasc. ii, p. 82, 1933.

the results of our experiments concerning the effect of intoxication on the mineral metabolism furnish evidence that tetany of calves is due to an intoxication.*

Dr. Seekles and I produced necrosis and abscesses in rabbits by subcutaneous injections of extracts from grass or from concentrates, and found a low blood-serum calcium ; it decreased to 5.6 mg. per cent. ; in other cases, for instance, with extracts of peanut meal, the magnesium values had diminished. With oral administration of these extracts, especially when they gave rise to inflammations, we found the same. The results of our experiments with cows and rabbits do not prove that tetany in calves is caused by protein intoxication, they demonstrate that the same mineral disturbances may be produced in different ways, one of them being overfeeding with protein.

As soon as signs of a labile state are observed it seems advisable to give protein poor feeds, *i.e.*, sugar pulp, molasses, maize meal, etc., instead of the greater part of the milk. To substitute grass for milk cannot always be recommended, as the percentage of protein in grass, especially in spring, is sometimes high.

In 1932 (*see* table) in one case of tetany in calves an intravenous injection of 10 gr. calcium chloride (Ca_2Cl_6 6aq.) and some magnesium chloride ($MgCl_2$ 6aq.) was given with immediate and permanent response. In other cases (1931, *see* table) the animals did not recover by this treatment. The first days after a treatment, besides a little milk, protein-poor food should be given.

Summary.—There is no reason to ascribe tetany of calves to magnesium deficiency. The faulty mineral metabolism, which is probably often accompanied by disturbances of the fat and carbohydrate metabolism, differs in the individual cases in so far as the calcium and magnesium values of the blood of one may be normal, and of the other decreased or increased ; again, in other cases both are abnormal. The Ca/Mg ratio differs in both directions from those in the blood of normal calves. In experiments with cows and rabbits on the influence of inflammations and of the administration of great amounts of protein analogous disturbances were found. Probably the disease is due to overfeeding with protein.

Clinical Articles

Contagious Ulcerative Stomatitis in Sheep.

By CHARLES WEIGHTON, M.R.C.V.S., *Stanmore,*
Late Veterinary Surgeon to the Royal Veterinary College.

CONTAGIOUS ulcerative stomatitis is also described under such names as contagious aphtha of lambs and kids, malignant aphtha, lip and leg ulceration, and " necrobacillosis." There are numerous references to the disease in veterinary literature, and this description is of an outbreak on a sheep station in New Zealand " carrying " 26,000 Corriedales. The large number involved may be exceptional.

The disease broke out in the winter of 1931, about the middle of January ;

* *Arch. f. Tierheilkunde*, **68**, 386, 1935 (not yet issued).

approximately 3,100 hoggets were affected—about 1,600 being affected first, and the remainder of this flock one week later. The hoggets were eight months old. Twelve wethers in the hogget flock were affected, but with these exceptions the disease did not appear among any of the older sheep. No cases were seen when the lambs were running with the ewes. A few cases had been noticed among the hoggets the previous year, but no serious outbreak of the disease had occurred on the station before, as far as could be ascertained. The source of the infection, as might reasonably be expected, was not discovered, and no reports of the existence of the disease on neighbouring runs came to hand.

Difficult as it may be to trace the source of infection in outbreaks of this disease, it was evident that mechanical injury (which was formerly thought to be responsible for allowing infection to gain entrance) could play little or no part in the disease. The flock had been running on clean tussock country, where the chance of injury to the mouth was small. As is well known, the disease usually affects lambs and hoggets. Is it possible that older sheep may have the disease in a mild form, it being carried from sheep to sheep, and later transmitted to the lambs, which exhibit marked clinical manifestations? "Mustering" probably plays an important part in its spread.

An examination of a number of affected sheep showed the upper and lower lips and the commissures of the mouth to be involved, while the disease extended in the majority of cases to the nostrils, causing difficulty in breathing. In most cases the disease was well advanced, the lesions taking the form of hard dark-coloured scabs, which on removal revealed a commencing necrotic condition of the subcutaneous tissue, which bled freely. A strong odour was given off. Prior to the discovery of a filtrable virus to be the cause of the disease it was thought that the *Bacillus necrophorus* (giving rise to the name "necrobacillosis") was responsible, and that it gained entrance through wounds caused by thistles and rough pasture generally. A micrococcus was also considered responsible. Carré, describing the disease as "contagious pustular muco-dermatitis," states that it is caused by a filtrable virus. Again, Carré (*Veterinary Record*, vol. xii, page 225, February 2nd, 1932) states Aynaud established that ecthyma and ulcerous stomatitis were manifestations of the same disease, which was due to a filtrable virus.

A large number of the affected hoggets responded to one dressing of tr. of iodine, while others were dressed a second and third time. No deaths occurred. Fortunately the disease responds readily to treatment. It is important to remove the crusts or scabs from the nostrils in order to facilitate breathing.

Contagious ulcerative stomatitis is alarming to the farmer who has had no experience of the disease. It causes a "check" to the hoggets, and in many cases, if early assistance is not given towards promoting recovery, the disease may be indirectly responsible for a "break" in the wool. A small percentage of neglected cases die. The disease must be differentiated from facial dermatitis or facial eczema.[1]

REFERENCE.

[1] Weighton, Charles: "Facial Dermatitis in Sheep," *Vet. Record*, No. 2344, vol. 45, 1933.

Ablation of the Eyeball and Closure of the Palpebral Fissure: An Improved Technique.

By DAVID ERIC WILKINSON, M.R.C.V.S.
Chigwell.

WHILST originality for this operation is not claimed by the writer, he has been unable to discover in any text-book on veterinary or ophthalmic surgery any reference to the method of removing the eyeball and closing the orbital cavity in a single operation. The advantages of this operation are so obvious and the technique so simple that it seems worth describing.

The surgical technique is as follows: Large animals should have a general anæsthetic; for dogs, morphia or nembutal; and for cats, nembutal is appropriate and sufficient to commence with. In all animals anæsthesia or narcosis should be followed by complete local anæsthesia. This is best induced by hypodermic injection of the eyelids and a deep injection into the orbital cavity posterior to the orbit itself.

The lids should be shaved and thoroughly cleansed with ether. The operation is commenced by seizing the upper eyelid about its middle with Spencer-Wells artery forceps and drawing it well forward. A sweeping semi-circular incision with a strong scalpel is then commenced above the medial canthus and behind the tarsus, penetrating the skin and subcutaneous tissue, and carried right round to the lateral canthus. The whole orbit is then drawn well downward and forward over the lower eyelid, the skin above retracted upward and dissected free from the sclera behind the conjunctival fornix, and both layers of fascia penetrated with the point of the scalpel to expose the " stem " of the eyeball formed by the retractor muscles, optic nerve and blood vessels.

By means of a curved needle a silk ligature is now passed around this stem. This ligature should pass through some of the retractor musculature to prevent it slipping off, and then be tightly tied. The semi-circular incision is then repeated through the skin and subcutaneous tissue of the lower lid, joining the upper incision at either canthus. The whole orbit is now drawn well forward and severed from its attachment to the retractor muscles just in front of the ligature, and dissected free from the subcutaneous tissues. By this means the orbit, lachrymal gland and secretory glands of the lids are removed and the edges of the eyelids left raw.

The next step is to close the orbital sac and arrest the fairly severe capillary hæmorrhage. This is accomplished by the insertion of interrupted silk sutures commencing at the inner angle, and stitching the lids together until the aperture is almost completely closed, leaving a gap at the external angle for plugging the cavity. The plugging is effected with a single piece of sterile tape pushed in with a probe director until the cavity is filled up. The free end is cut off close to the wound.

Next day this tape is seized with forceps and gently pulled out. The only

foreign body then left in the wound is the silk ligature embracing the artery. The sac is well irrigated daily with a warm antiseptic solution by means of a Higginson enema syringe, thoroughly washing out all blood clots and debris. In a few days the ligature comes away during irrigation or may be removed with forceps. Replacement of any sutures that may cut through is not necessary, as adhesions between the raw edges of the skin commence very early and granulation in this very vascular area is abundant. Bandages and eyeshades of all kinds should be avoided, but interference with the wounds by the patients must be prevented by pillar reins in horses and the Elizabethan collar in dogs and cats. The writer has performed this operation on three horses, one cow, one cat and several dogs with universally excellent results. The maximum time for complete healing of the wound was fourteen days.

Abstracts of Current Literature

Intoxications of Vegetable Origin. By A. Henry. *Recueil de Méd. Vétérinaire*, Tome cix, No. 11.

M. Henry calls attention to the fact that in pastures sufficiently nutrient and not too overstocked, animals generally possess the instinct to discard a great number of toxic plants. In this case an excellent method of spotting the bad plants is to examine the tufts or abandoned places in the pasture: one chiefly finds there Senecio jacobæa, Colchicum autumnale, Linum catharticum, Mille pertuis and Brachipodum. In periods of scarcity in overstocked pastures individual protective instinct disappears: the animals, pressed by hunger, do not distinguish the harmful plants, and accidents occur.

The greater part of intoxications of vegetable origin possess a certain number of basic symptoms which are well recognised. Action on the digestive tube is almost always cathartic: nausea, vomiting, colic, diarrhœa. Action on the nervous system, often with a phase of excitability, followed by somnolence and muscular weakness. The temperature generally remains normal, or even descends to subnormal. One observes more or less disturbance of the liver, the urinary apparatus, the nervous system, or the skin. In the following table, far from complete, I have tried to point out the principal symptoms of intoxication which help us in diagnosis.

Principal Symptoms of Poisoning by Plants.

If the following symptoms occur:	*You ought to think of poisoning by:*
Death in a few minutes	Plants containing hydrocyanic acid—Ricinus; robinia.
Rapid death after movement	Waste cacao shells (Theobromine).
Coma	Poppy.
Collapse	Colchicum; tobacco.

Nervous excitement	Ranunculaceæ ; veratria ; belladonna.
Inebriety	Italian rye grass ; Bromus secalinus ; Umbelliferæ ; loco weeds.
Animals boring against the wall... ...	Umbelliferæ ; Cassia occidentalis.
Convulsions	Cytisus ; water hemlock ; digitalis.
General paralysis	Hemlock ; colchicum.
Dilation of the pupil	Cytisus ; brooms ; Solanaceæ ; aconite.
Contraction of the pupil...	Poppy ; tobacco.
Dry skin and mouth	Brooms ; Solanaceæ.
Salivation	Caryophyllaceæ ; sinapis ; colchicum ; hemlock ; cytisus.
Paralysis of the hind end and roaring ...	Horse-tail—Equisetum lathyrus.
Dysphagia...	Colchicum ; Cassia occidentalis ; caroub beans.
Diarrhœa, often with vomiting ...	The greater number of toxic plants.
Constipation	Poppy ; lupins ; chestnuts ; plants with tannin.
Vomiting without diarrhœa	Cytisus.
Icterus	Lupins ; senecons.
Hæmaturia	Mercury ; colchicum ; Ranunculaceæ.
Nasal hæmorrhages, petechiæ, bloody diarrhœa	Ricinus ; robinia ; ferns ; melilot ; giant fennel
Abundant diuresis	Aristolochia.
Œdema, erythema, epidermic exfoliation on non-pigmented parts	Sarrasin and several of the Polygonaceæ ; Mille pertuis ; clovers ; and diverse Papilionaceæ

Among the vascular cryptograms, two groups of plants may cause accidents : the ferns or brackens, and the horse-tails.

Ferns.—Several species of ferns may cause sensibility to light in animals ; some have been asserted to release hydrocyanic acid, but in fact only one kind can be incriminated as a cause of important mishaps, and that is the tall fern called royal or imperial ; *Pteris aquilina* (bracken) which flourishes in siliceous earth. Animals hardly touch it in the green state ; it is chiefly as litter and in the dry state, and by prolonged consumption, that accidents arise. The symptoms remind one rather of an infectious malady, of anthrax, for example ; hæmorrhages occur in different parts of the body, as I have also had occasion to mark in other intoxications, such as *fennelism* and *melilotism.*

Horse-Tail (*Equisitaceæ*).—It is well known that the horse-tails, and notably the two species *Equisetum maximum* and *E. arvense*, are capable of producing fatal intoxications in the horse. Ovines are less affected, and the ox seems to be able to graze on it with discretion and without accident. The active principle is an acid—*equisetic acid* ; the plant preserves all its activity when dried. Hay con-

taining horse-tails should be discarded. It is not always easy to recognise it, as the little segments disarticulate and may be mistaken for the flower of hay.

The effects of the poison only appear a certain time after ingestion, after a period of two to five weeks' accumulation, young horses being most susceptible. The first symptoms are dullness and falling-off in flesh, then there is muscular weakness, notably of the hind end. The pulse is weak, temperature is normal or sub-normal, extremities cold, mucosæ pale. Appetite is present to the end. Finally the animals fall on the ground, show some excitement movements, the pulse is quickened, the temperature rises. Hypostatic pneumonia is a frequent complication.

If the case is not too far advanced a cure can be obtained by the action of purgatives and stimulants of the heart and nervous system ; if the annimal cannot stand up, it should be slung to avoid lung complications.

Phanerogams.—These plants are among the most interesting in toxicology.

Taxus (*Yew*).—This tree causes most accidents. All animals and even birds are affected by it. Classical authors write that it takes 800 grammes to one kilogram to poison a horse ; four kilograms for an ox ; 400 to 500 grammes for the sheep. It is obvious that these indications need revision. It is chiefly the horse that is involved, because of being often imprudently tied up near the tree. The green foliage tempts the animal, above all at the end of winter : the protective instinct is almost always at fault here. All parts of the plant are toxic, except perhaps the fleshy envelope of the false berry ; the young shoots of a clear green tint are a little less toxic.

Animals at rest in the stable are less affected than those moving about. It is sufficient to take a horse out after having experimented on it with a minimal dose. At first it presents no trouble, but after trotting it subsides after a few paces. The toxic doses indicated in books on poisons will probably be revised in the light of this experience. I will mention a curious fact noted a few years ago. On a farm where yew branches had been put in the rack as cattle fodder and caused deaths, at the autopsy on the animals, fowls and ducks got at the contents of the rumen and poisoned themselves.

The poison is known as taxine. Yew always causes a rapid and acute intoxication ; death seems to occur by its action on the bulbar centres. A careful autopsy always allows of the finding of bruised leaves whose fragments are easily recognised. Many breeders and graziers still ignore the very great toxicity of the yew. It is up to you to quash this notion.

A very large number of vegetables belonging to the most diverse families are capable of producing hydrocyanic acid. I will only confine myself here to those which can liberate a sufficient quantity of the toxic principles to cause accidents. It is known that hydrocyanic acid arises from the action of soluble ferments more or less specific, by hydrolysis of different glucosides which on this account are called *cyanogenetic* glucosides. In our country animals can be intoxicated by certain gramineæ, linseed cake and amygdalæ.

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Graminaceæ.—Several species of Graminaceæ can contain a generator glucoside of hydrocyanic acid, *viz., dhurrine.* These are chiefly the sorghums (*Sorghum vulgare* and *Sorghum halepense*), the maizes (*Phragmites communis* and *Phalaris arnulinacea*). But it appears that in these plants the formation of glucoside is only exceptional. It only occurs after periods of drought with second crops that have undergone a retardment of growth, and then accidents may occur.

Linseed.—As regards linseed (*Linum usitatissimum*), fortunately, it only exceptionally contains a cyanogenetic glucoside, *via., linamarine.* Accidents due to linseed cake are well known ; I will not dwell on them. Here the specific ferment of the glucoside is called *linase* or *linamarase.* This ferment can easily be destroyed by heat ; drinks made with boiling water with dangerous cakes can therefore in principle be sterilised and consumed without danger ; I say in principle, because in reality in the digestive tube the glucoside could recover perfectly in another plant or in the intestinal juices another intact ferment, which would be quite capable without real specificity of slowly releasing or diluting it.

Amygdaleæ.—The Amygdaleæ may be considered very rich in hydrocyanic acid ; but animals only rarely have occasion to consume it ; accidents have been recorded from ingestion of the leaves of laurel (*Cerasus laurocerasus*, or the distribution of bitter almond cakes (*Amygdalus communis amara*).

Other plants liberating hydrocyanic acid may be mentioned : The toxic haricot (*Phaseolus lunatus*) which now and again causes accidents ; common elder, cultivated vetch, sea triglochin.

Principal Cyanogenetic Plants.

General sensibility of animals.—Fatal dose per kilo. : horse, about 1 mg. ; ox, about 1.5 mg. ; sheep, about 2 mg.

	Glucoside	Ferment	Localisation	Release
Graminaceæ—				
Sorghus and Maize Gr. aquatic Phragmites Glyceria, Phalaris Catabrosa	Dhurrine $C_{17}H_{17}C_7N$	...	Second crops	0.2 per cent.
Juncaceæ—				
Triglochin maritima	...	...	Not toxic if dry	...
Euphorbiaceæ—				
Manioc	Manihotoxin	...	Juice of the root	0.035 per cent.
Linaceæ—				
Linseed	Linamarine $C_{17}H_{17}O_6N$	Linase or Linamarase	...	0.13 per cent.
Papilionaceæ—				
Toxic haricot	Phaseolunatine	...	...	0.06 to 0.32%
Vetches	Vicianine	...	...	Feeble
Lotus	Lotusine	...	...	,,

	Glucoside	Ferment	Localisation	Release
Caprifoliaceæ—				
Common elder	Sambucinigrine	...	...	Feeble
Amygdaleæ—				
Bitter almond	Amygdaline	Emulsine or	Cakes	Very strong,
Laurel	Lauro-cerasine	Synaptase	Leaves	perceptible
Compositæ—				by smell
Dimorphotheca spectabilis	Linamarine	...	South Africa	1.7 per cent.
D. ecklonis	...	...	...	0.25 per cent.

Symptoms of Poisoning by Plants containing Hydrocyanic Acid.

In not too massive intoxication one sees several succeeding phases. First there is dyspnœa with acceleration of the heart, salivation, nausea and vomiting. Secondly, nervous phenomena, convulsions, vertigo, trembling and diminution of sensibility. At this time the toxic principle has spread through the whole system, and it is eliminated partly by the lungs; the air expired takes on the odour of prussic acid. The last phase is asphyxia: respiration becomes difficult through action on the central nervous system; it is arrested and the heart stops.

At the autopsy the viscera often emit the characteristic odour of prussic acid. It may be noted that prussic acid is an excellent preservative, and that the cadavers putrefy slowly.

The vapours of prussic acid turn picro-soda papers reddish-brown.

Treatment.—Action of the poison is so rapid that treatment is difficult. Atropine, ammoniacal vapours, glucose especially, and if administered intravenously or intraperitoneally. Intravenous injections of methylene blue. South African farmers consider sulphur the most practical antidote. Generally, it may be said that cyanogenetic vegetables lose their activity by drying, for hydrocyanic acid is very volatile.

Personal

MEMBERS of the National Veterinary Association will read with regret of the death of Mr. Wynn Lloyd, F.R.C.V.S., J.P., who, until a few years ago, practised in Carnarvon. His genial manner and striking personality will be remembered by many of his colleagues who visited Carnarvon on the occasion of the annual gathering of the National Veterinary Medical Association in Wales some few years ago. His death will be much felt by his many friends both in and outside the profession.

APOLOGIA.

On page 66 of the February issue of this Journal there appeared a paper by Dr. Russell Greig, Director of the Moredun Institute, bearing the title "Louping-ill, Braxy and Lamb Dysentery." By an unfortunate oversight, we omitted to state that this was a broadcast talk. We now hasten to acknowledge that we should not have published the talk in the form of a scientific paper, and, further, that no permission to do so had been received either from the British Broadcasting Corporation or from Dr. Russell Greig. We take this opportunity of expressing our deep regret to those concerned.

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